ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 1 of 54

Guidehouse
Outwit Complexity

2023 IRP Forecast: DESC Electric Vehicle & Charging Infrastructure

Final Report

November 2022

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

DISCLAIMER

This deliverable was prepared by Guidehouse Inc. for the sole use and benefit of, and pursuant to a client relationship exclusively with Dominion Energy (VA, NC, SC) ("Client"). The work presented in this deliverable represents Guidehouse's professional judgement based on the information available at the time this report was prepared. Guidehouse is not responsible for a third party's use of, or reliance upon, the deliverable, nor any decisions based on the report. Readers of the report are advised that they assume all liabilities incurred by them, or third parties, as a result of their reliance on the report, or the data, information, findings and opinions contained in the report.

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 2 of 54

Report Contents

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 3 of 54

Guidehouse
Outwit Complexity

Executive Summary

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

January 20, 2023

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 4 of 54

EV Market Fundamentals

Significant growth in Electric Vehicles is expected due in part to accelerating demand, increased model availability, and strong political, environmental, and regulatory support.

Macros-level drivers are leading a fundamental shift and acceleration of EV adoption. The combination of the ICEV ban and automaker commitments results in a significantly increased PEV outlook.

Market Drivers & Support

- **Vehicle Availability & Brand Transformation:** Vehicle automakers continue to press forward with aggressive goals in support of an all-EV future. A handful of automakers have announced goals to reach 40-50% EV model sales by 2030.
- **ICE Vehicle Ban (State Policy):** The California ICE Vehicle (ICEV) Ban requires, all new cars and passenger trucks sold in California be zero-emission vehicles by 2035. We expect most ZEV states to adopt this ban into state policy, and it represents a fundamental shift to the future EV landscape. This policy shift represents the biggest driver of change in vehicle adoption forecast versus previous forecasts.
  - ➢ *South Carolina: ICE availability to follow non-ZEV state assumptions with model availability dropping to ~25% by 2035*
- **Federal Policy:** Strong federal vehicle and infrastructure incentives (e.g., IRA, IIJA) NEVI will boost PEV sales across light-, medium-, and heavy-duty segments and continue to pull forward customer demand and decrease "range anxiety" hurdles.
  - ➢ *South Carolina: NEVI budget for South Carolina used to estimate incentive amounts*

Market Constraints & Headwinds

- **Supply Chain:** Although there are some near-term supply-chain limitations, especially in chips, batteries, other component parts, EV growth will be hindered short term. Long term supply chain challenges will subside due to increased production and component availability supporting projected EV growth.
- **Economic Pressures:** Near-term economic slowdown (e.g., rising interest rates, increase cost of capital, investor uncertainty) provides potential slow-down in production, but that slowdown is offset by pinned up demand for EVs. The positive cost of ownership for typical EV owners also provides a positive influence in EV market growth.

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 5 of 54

2022 DESC EV & Charging Infrastructure Forecast Results

Significant growth in Electric Vehicles are expected across the DESC service territory over the next decade, with the most significant uptick between 2028-2035.

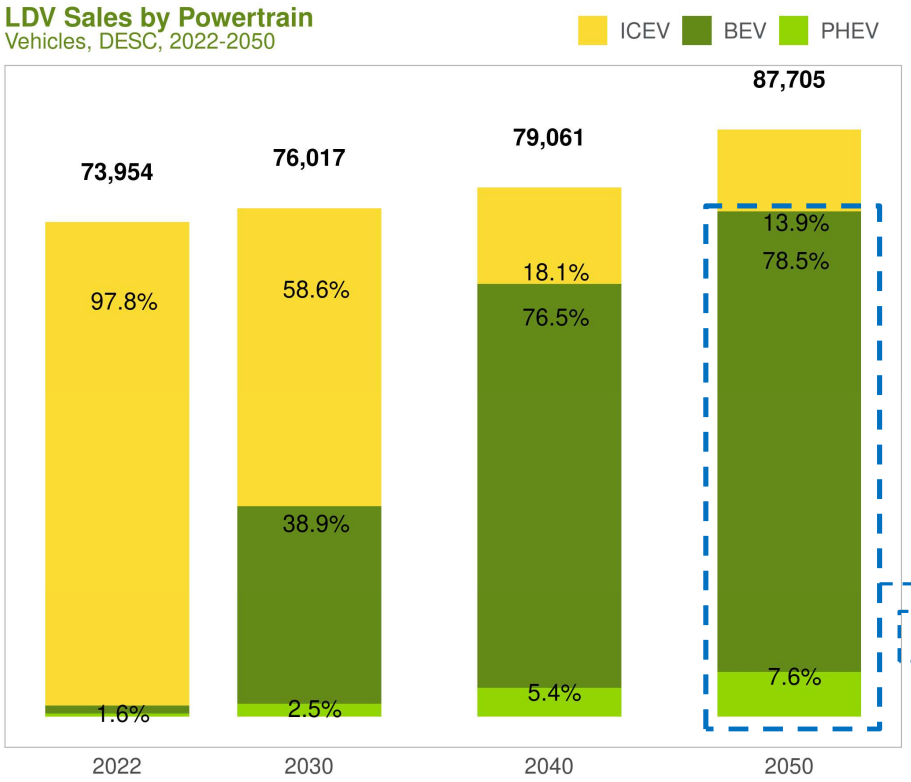
- PEV Sales are expected to grow 39% CAGR through 2030
  - PEV sales for LDVs and MHDVs expected increase from ~1,600 in 2022 to ~32,000 by 2030, and to ~77,000 by 2050.
  - PEV sales in 2030 is expected to be ~31,000 (98%) LDV, ~300 (1%) MDV and ~200 (<1%) HDV.
  - PEV sales in 2030 is expected to reach ~3,000 (8%) for fleet-owned vehicles and 30,000 (92%) for individually-owned vehicles.
- Total PEV Population expected to grow 42% CAGR through 2030
  - "On the road" PEV population for LDVs and MHDVs expected increase from ~5,000 in 2022 to ~115,000 by 2030, and to ~1,000,000 by 2050.
  - "On the road" PEV population in 2030 is expected to be ~112,000 (98%) LDV, ~2,000 (~2%) MDV and ~200 (<1%) HDV.
  - "On the road" PEV population in 2030 is expected to be ~9,000 (8%) for fleet-owned vehicles and ~106,000 (~92%) for individually-owned vehicles.
- LDV & MHDV Charger needs expected to be driven by L2 and DCFC technologies
  - Total charger volume is projected to reach ~102,000 by 2030.
  - Total charger volume in 2030 is expected to be predominately L2 (60%) with L1 and DCFC at 37% and 3% respectively.
- "Home-base" charging to drive EV Load and annual energy consumption
  - Annual energy consumption from charging LDVs and MHDVs is projected to reach ~437GWh by 2030.

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

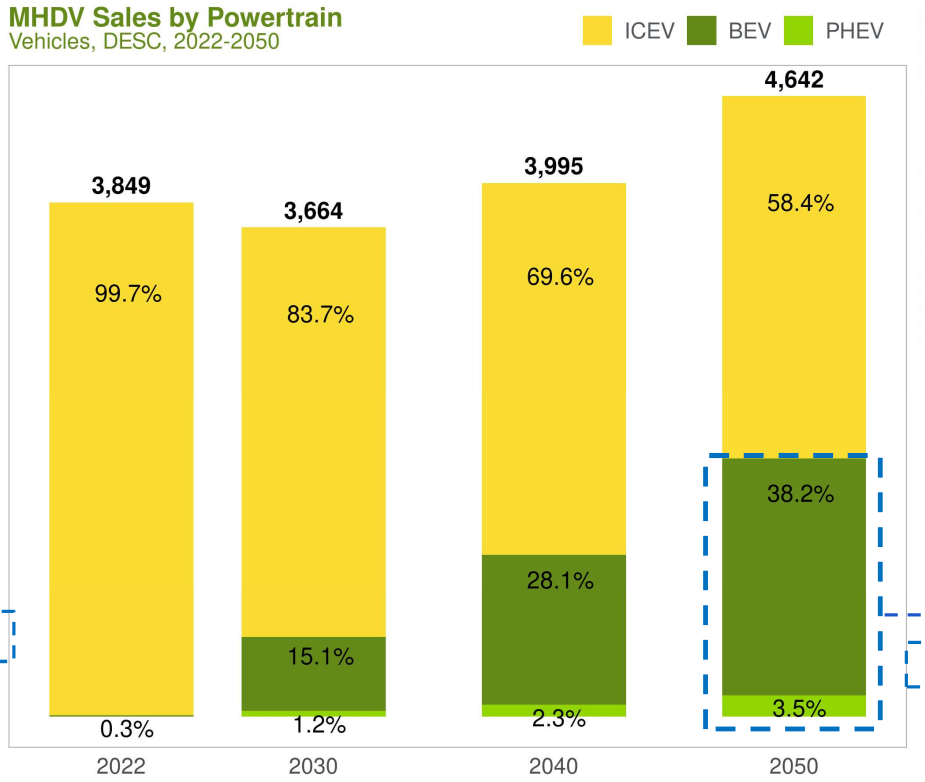
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 6 of 54

LDV & MDV PEV Sales expected to grow 39% CAGR through 2030

- BEV and PHEV are expected to make up **84% of total vehicle sales market share** by 2050
- BEV and PHEV are expected to make up **86% of LDV sales market share** by 2050
- BEV and PHEV are expected to make up **42% of MHDV sales market share** by 2050



86%



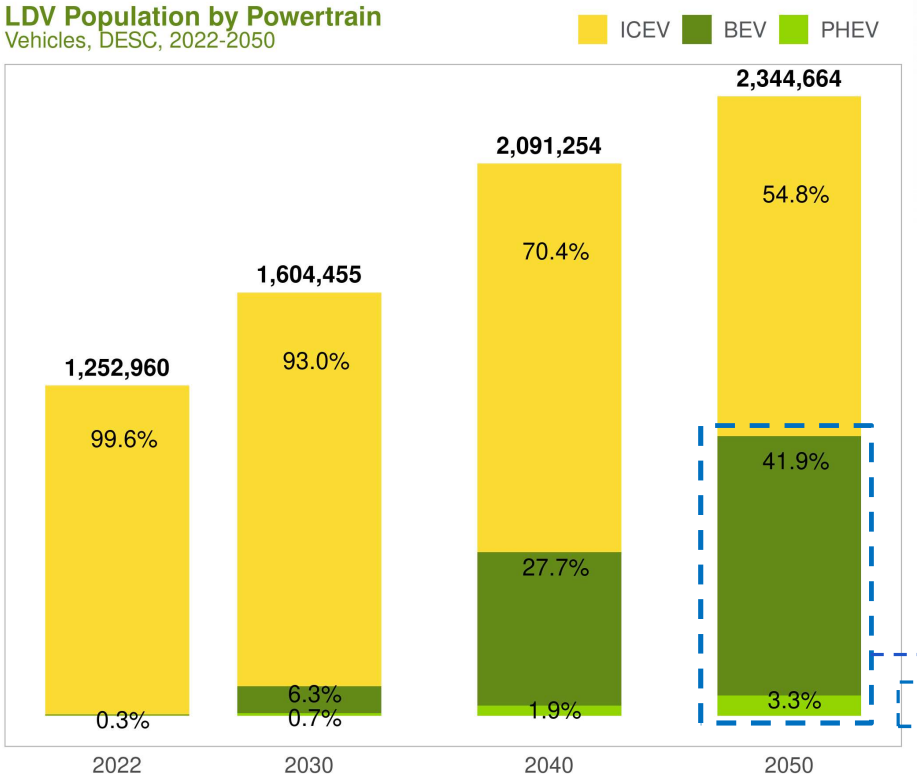
42%

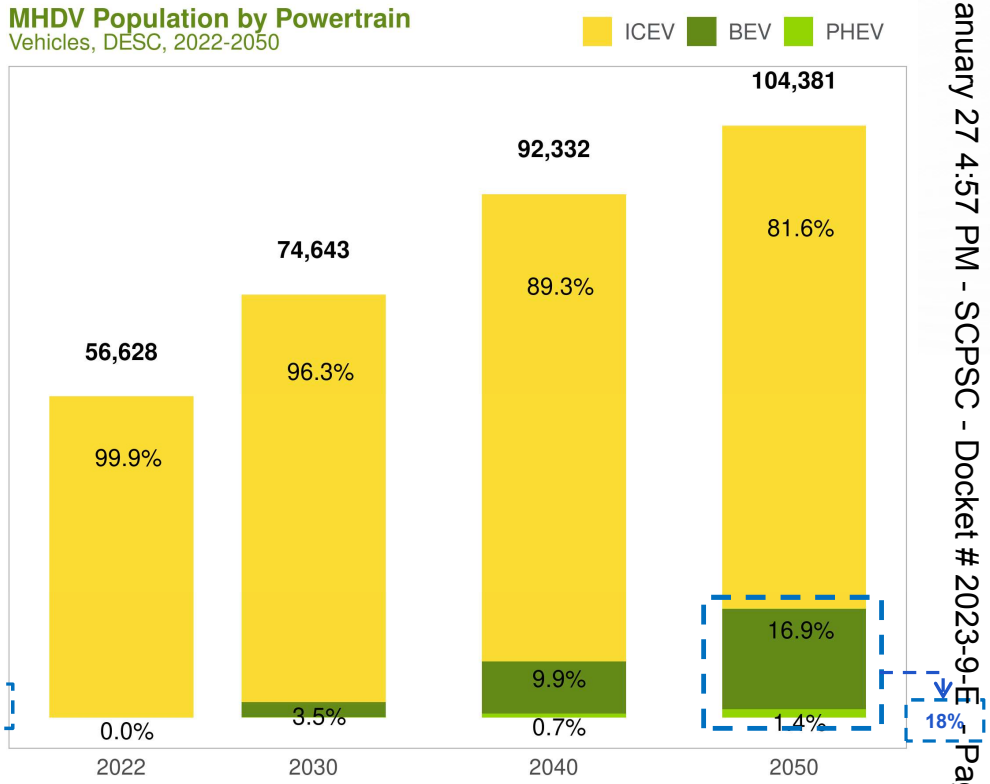
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 7 of 54

Total PEV Population expected to grow 42% CAGR through 2030

- BEV and PHEV are expected to show **44% penetration of total vehicle population** by 2050
- BEV and PHEV are expected to show **45% penetration of total LDV population** by 2050
- BEV and PHEV are expected to show **18% penetration of total MHDV population** by 2050





©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

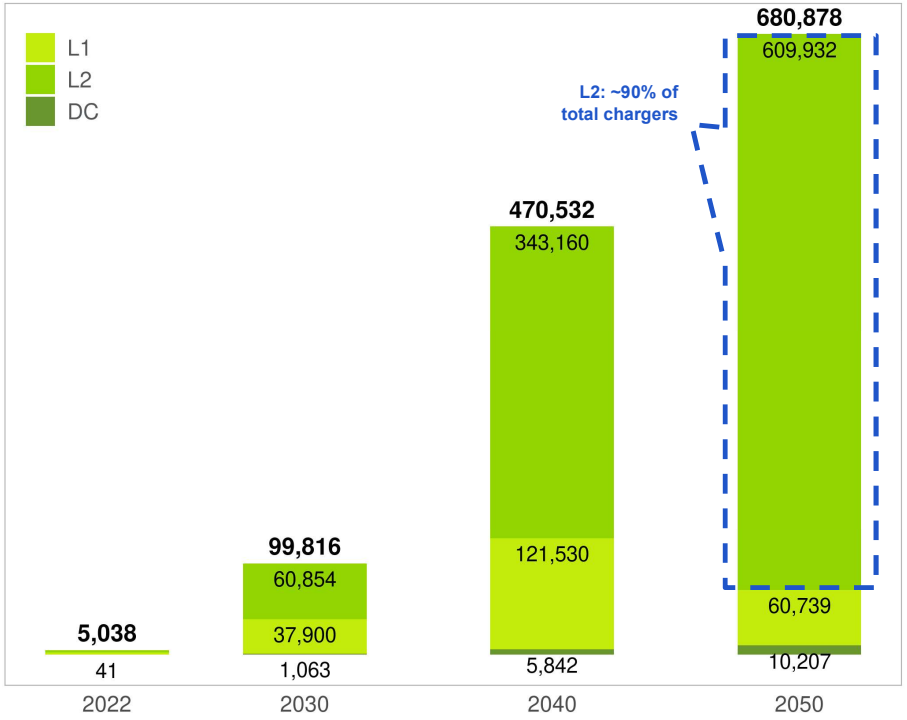
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 8 of 54

LDV & MHDV charger needs expected be driven by L2 and DCFC

- Total charger volume in 2050 expected to be **87% L2, 9% L1 and 4% DCFC**
- LDV charger volume in 2050 expected to be **90% L2, 9% L1 and 1% DCFC**
- MHDV charger volume in 2050 expected to be **98% DCFC and 2% L2**

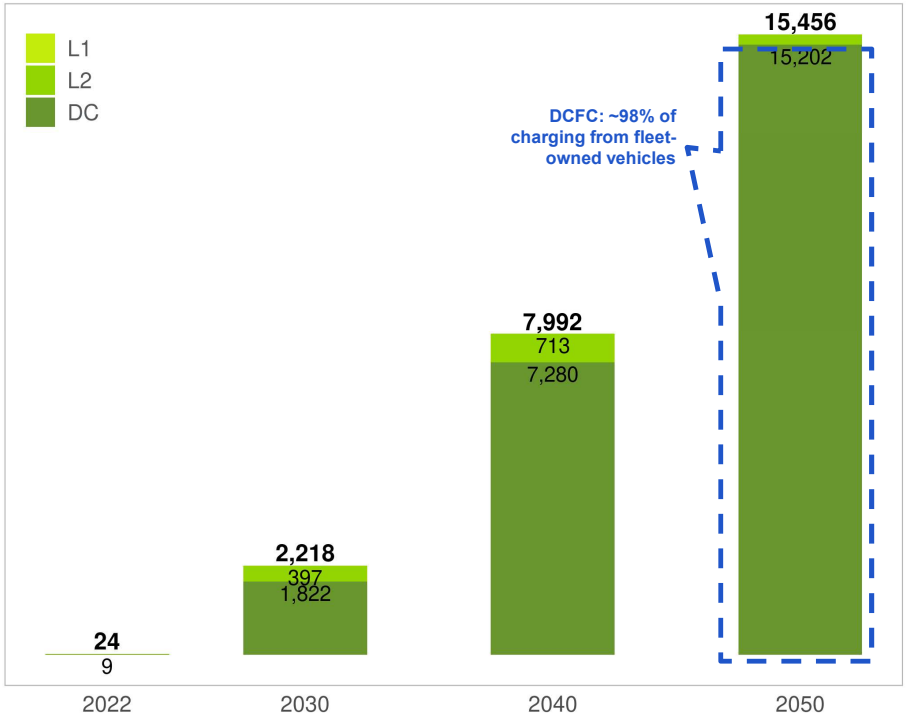
LDV EVSE By Technology

Charger Count, DESC 2022-2050



MHDV EVSE By Technology

Charger Count, DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

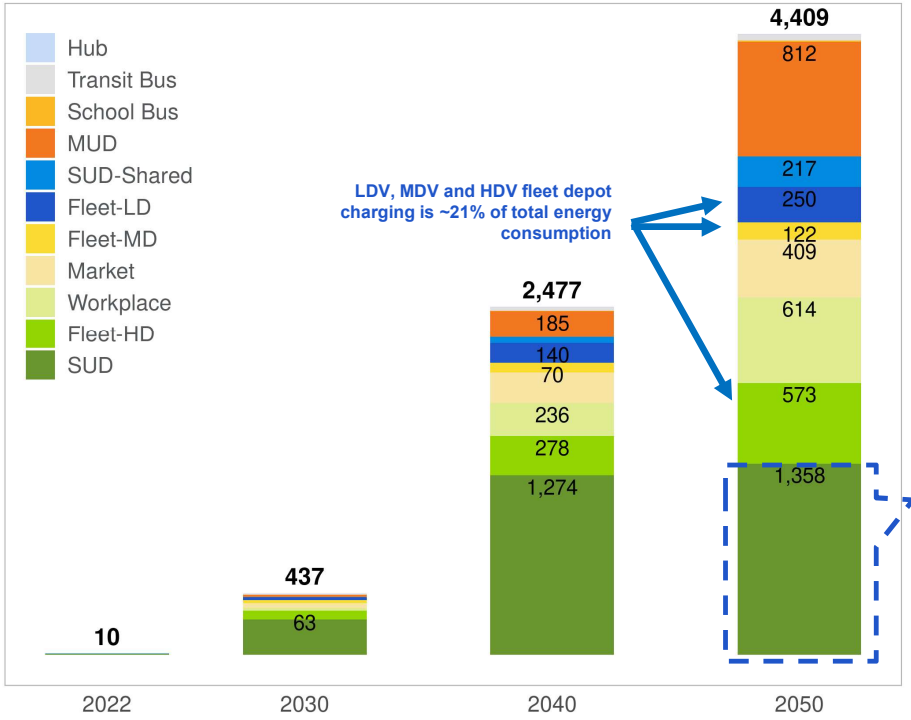
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 9 of 54

"Home-base" charging to drive EV Load & energy consumption

- Annual energy consumption expected to reach **~4TWh** in 2050 with peak load reaching almost **1GW** in 2050
- Single Unit Dwelling (SUD) charging and fleet depot charging (Fleet-LD, Fleet-MD, Fleet-HD) drive annual energy consumption at **31%** and **21%** respectively
- Peak load is expected to have highest contribution from **L2 (68%)** and **DCFC (27%)** technologies

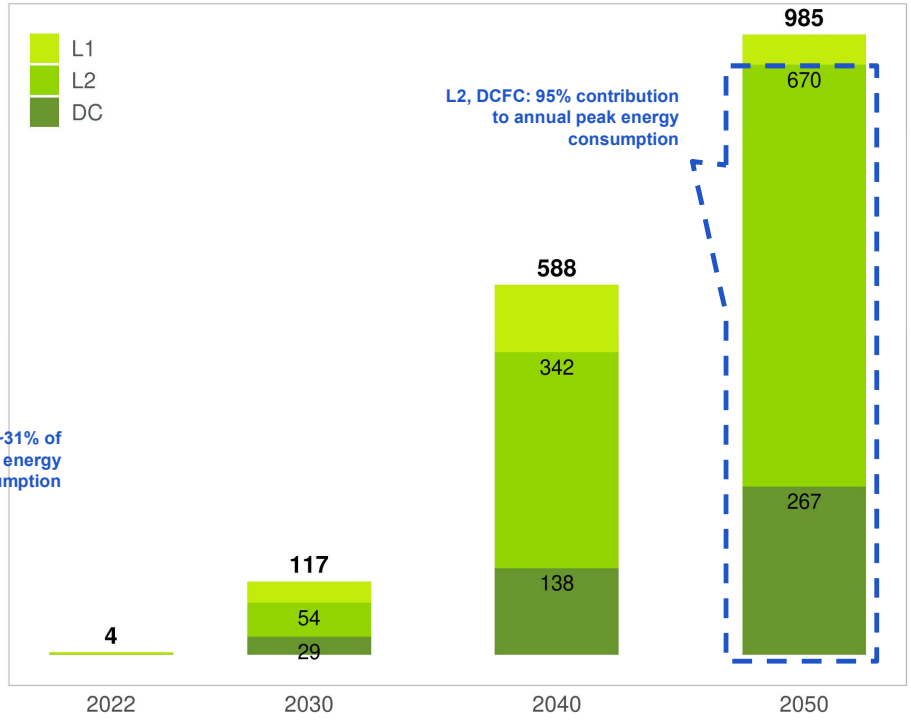
Annual Energy Consumption By Use Case - ALL

Impacts (GWh), DESC 2022-2050



Contribution to Annual Peak Load By Technology - ALL

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

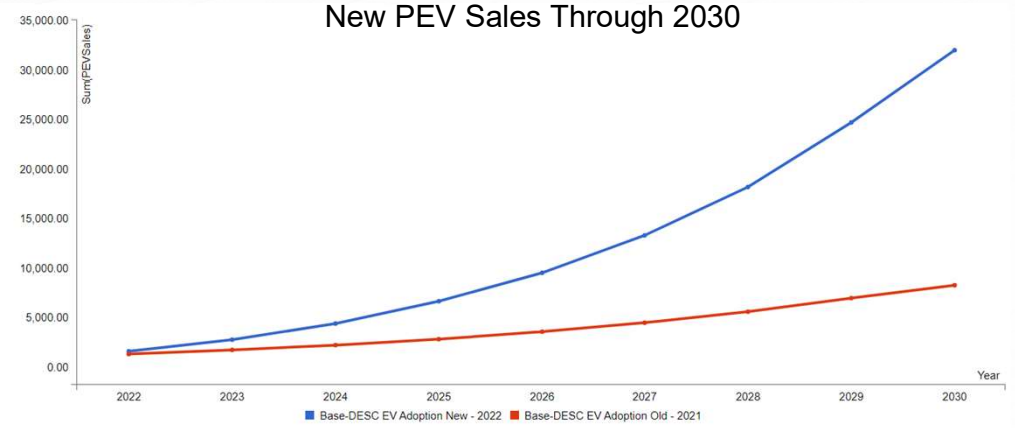
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 10 of 54

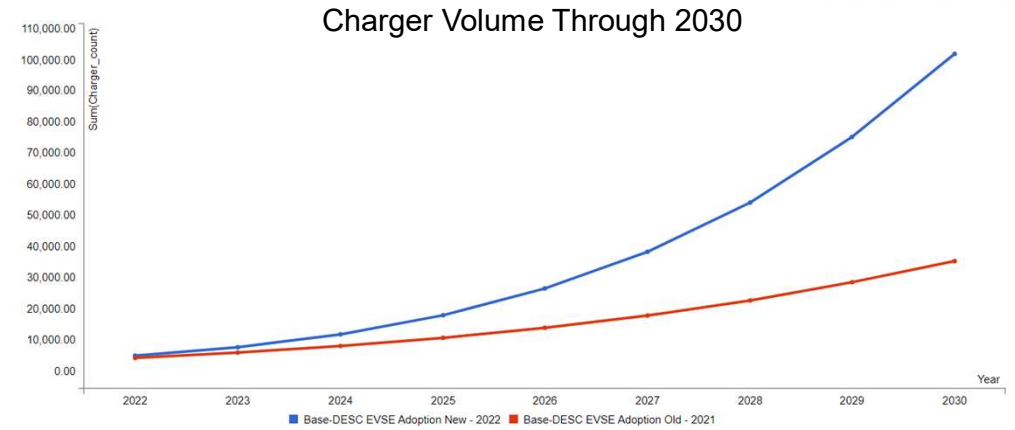
Comparison to Previous Market Forecast (2021)

Growth in adoption forecast relative to previous 2021 forecast is primarily driven incremental policy (CA ICE Ban) and automaker announcement impacts

- PEV sales for LDVs and MHDVs expected to reach ~32,000 by 2030
  - 3.2x growth relative to 2021 results
  - True impacts of IRA expected to kick in by mid-late 2020s when more OEMs align with battery production & minerals restrictions
- Total PEV population for LDVs and MHDVs expected to reach ~115,000 by 2030
  - 3x growth relative to 2021 results

- Total EVSE volume expected to reach ~102,000 by 2030
  - 3x growth relative to 2021 results
- Total L2 and DCFC volume expected to reach ~64,000 by 2030
  - 4x growth relative to 2021 results





©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 11 of 54

Guidehouse
Outwit Complexity

DESC Forecast Results: Electric Vehicle & Charging Infrastructure Analysis

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 12 of 54

Guidehouse
Outwit Complexity

DESC Forecast Results: Electric Vehicle & Charging Infrastructure Analysis

PEV Adoption Forecast

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 13 of 54

PEV Adoption Forecast Summary

Forecast Summary

- PEV Sales are expected to grow 39% CAGR through 2030
  - PEV sales for LDVs and MHDVs expected increase from ~1,600 in 2022 to ~32,000 by 2030, and to ~77,000 by 2050.
  - PEV sales in 2030 is expected to be ~31,000 (98%) LDV, ~300 (1%) MDV and ~200 (<1%) HDV.
  - PEV sales in 2030 is expected to reach ~3,000 (8%) for fleet-owned vehicles and 30,000 (92%) for individually-owned vehicles.
- Total PEV Population expected to grow 42% CAGR through 2030
  - In total, the "on the road" PEVs population will increase to ~115,000 by 2030, and to ~1,000,000 by 2050.
  - "On the road" PEV population in 2030 is expected to be ~112,000 (98%) LDV, ~2,000 (~2%) MDV and ~,000 (<1%) HDV.
  - "On the road" PEV population in 2030 is expected to be ~9,000 (8%) for fleet-owned vehicles and ~106,000 (~92%) for individually-owned vehicles.

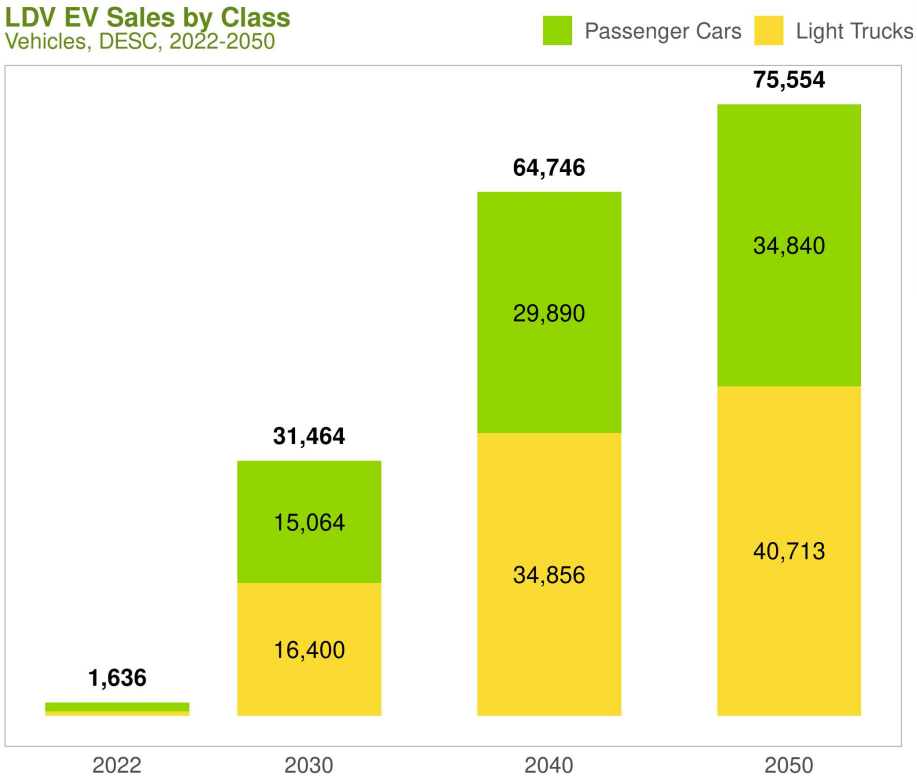
Market Drivers

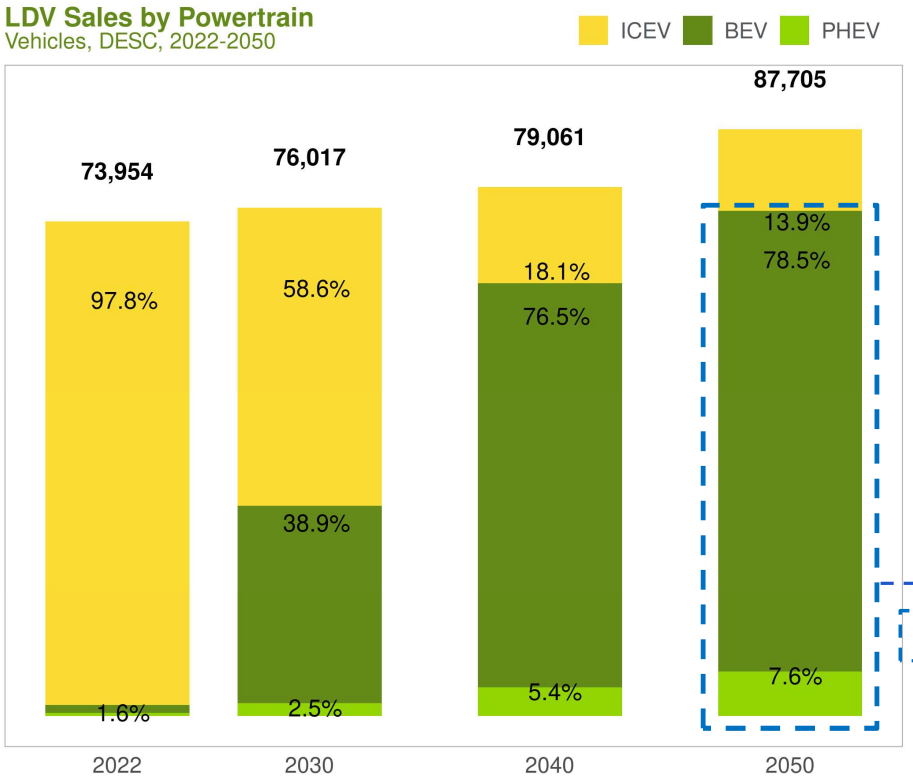
- Vehicle Availability & Brand Transformation
  - Vehicle automakers continue to press forward with aggressive goals in support of an all-EV future. A handful of automakers have announced goals to reach 40-50% EV model sales by 2030.
- ICE Vehicle Ban (State Policy)
  - The California ICE Vehicle (ICEV) Ban requires, all new cars and passenger trucks sold in California be zero-emission vehicles by 2035. We expect most ZEV states to adopt this ban into state policy, and it represents a fundamental shift to the future EV landscape. This policy shift represents the biggest driver of change in vehicle adoption forecast versus previous forecasts.
  - ➢ *South Carolina: ICE availability to follow non-ZEV state assumptions with model availability dropping to ~25% by 2035*
- Federal Policy
  - Strong federal vehicle and infrastructure incentives (e.g., IRA, IIJA) NEVI will boost PEV sales across light-, medium-, and heavy-duty segments and continue to pull forward customer demand and decrease "range anxiety" hurdles.
  - ➢ *South Carolina: NEVI budget for South Carolina basis for estimate incentive amounts*

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 14 of 54

Over 75,000 LDV EV annual sales in 2050 (~86% market share)

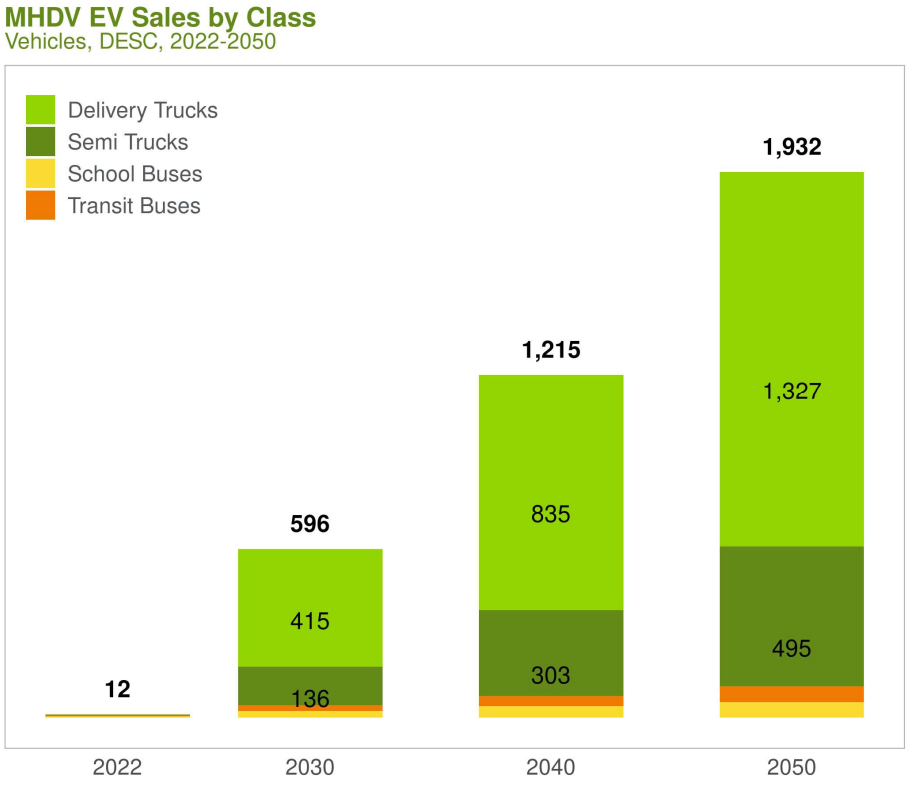


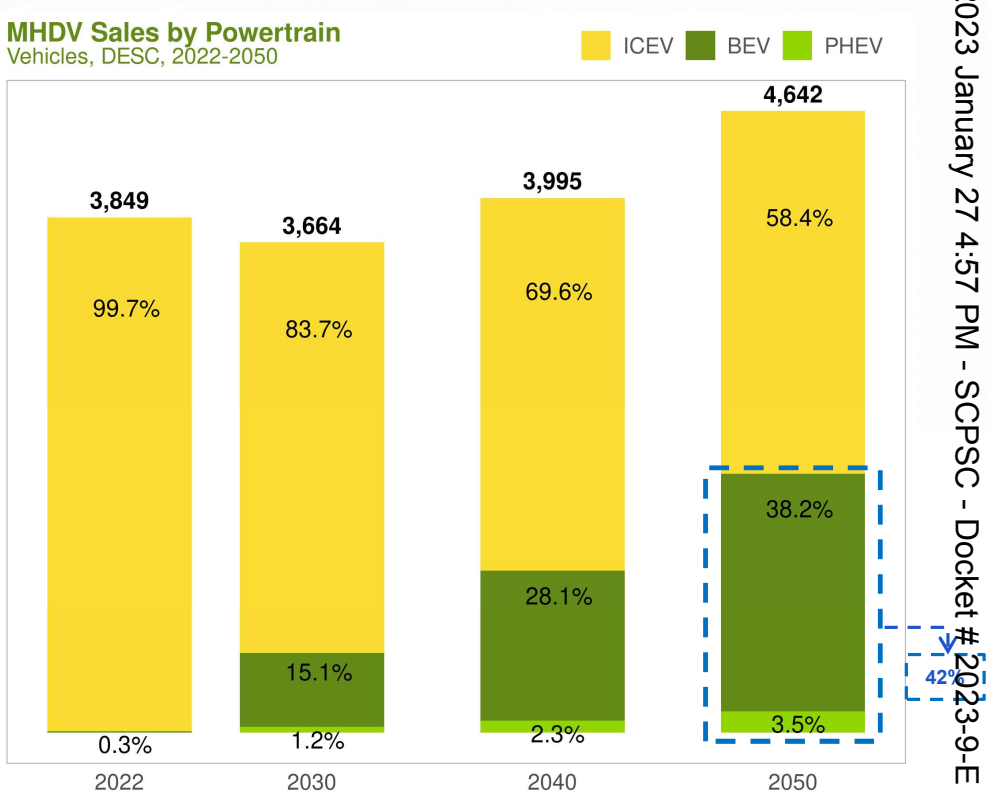


©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 15 of 54

Over 1,900 MHDV EV annual sales in 2050 (~42% market share)

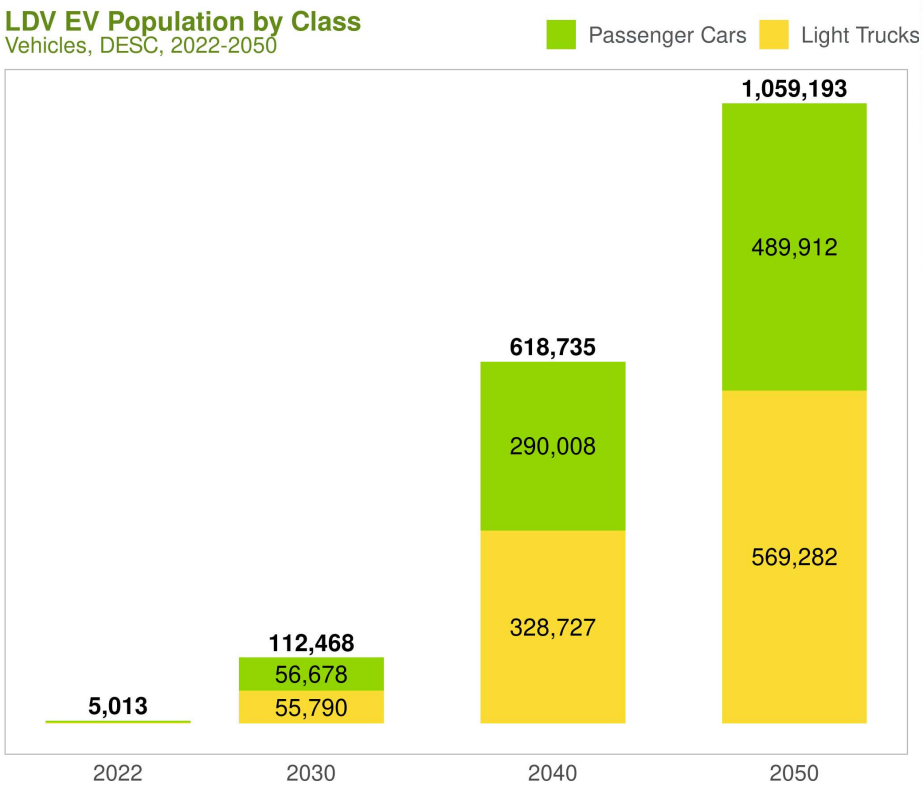


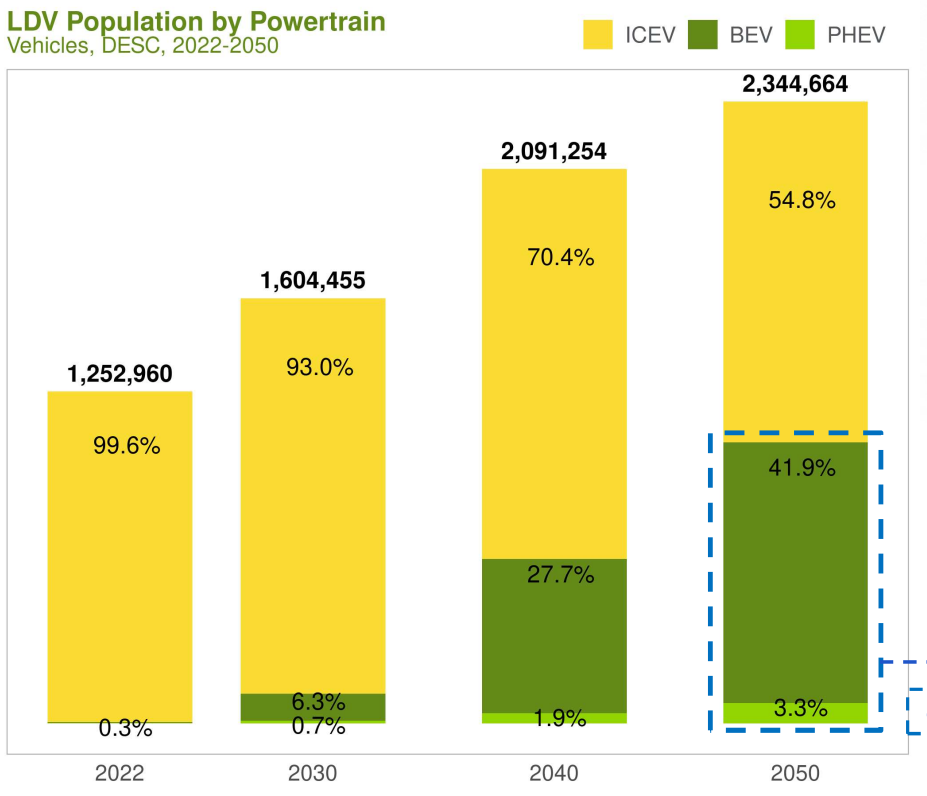


©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 16 of 54

Over 1 million LD EVs expected by 2050 (~45% penetration)

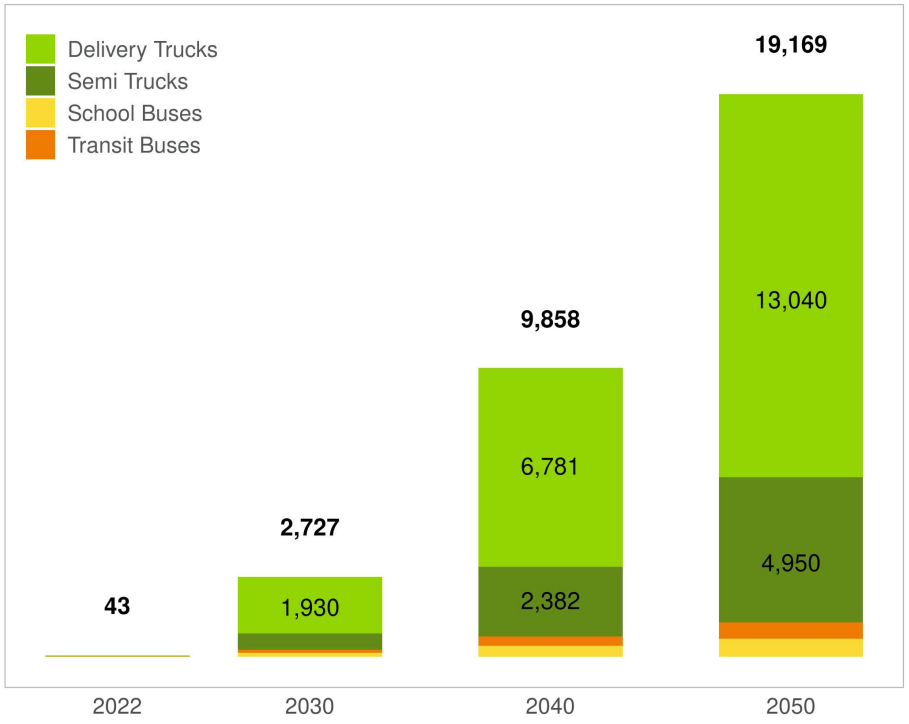


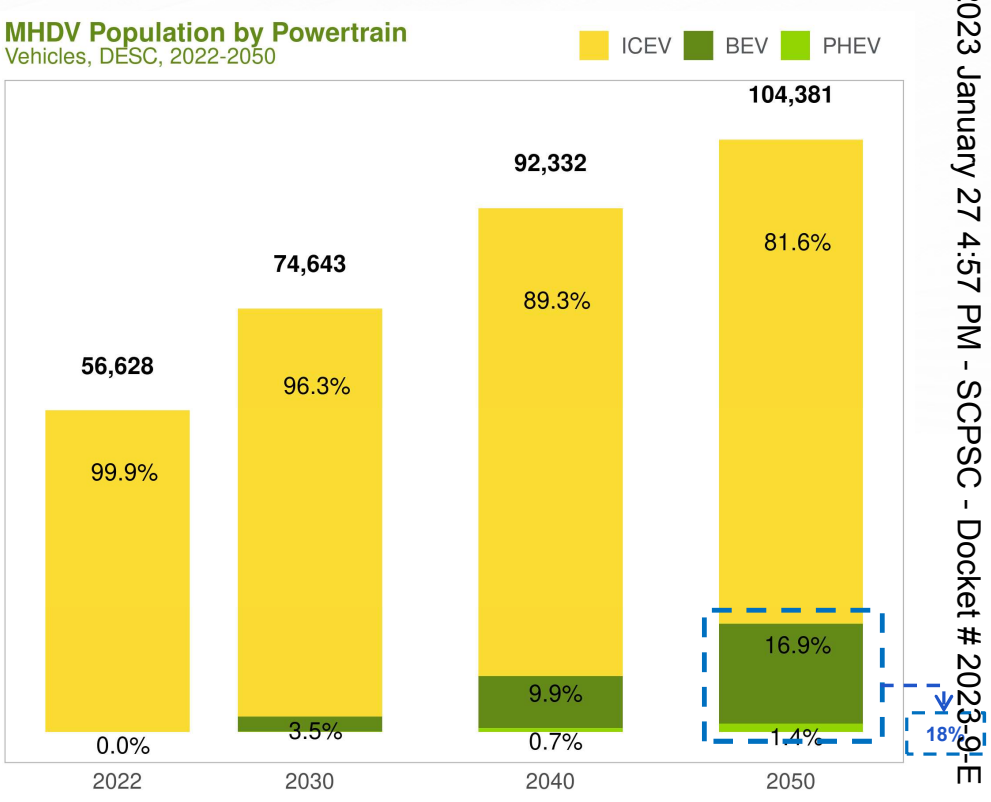


©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 17 of 54

Over 19,000 MHD EVs expected by 2050 (~18% penetration)





©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 18 of 54

DESC Forecast Results: Electric Vehicle & Charging Infrastructure Analysis

EV Charging Infrastructure Forecast

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 19 of 54

EV Charging Infrastructure Forecast Summary

Forecast Summary

- LDV & MHDV Charger needs expected to be driven by L2 and DCFC technologies
  - Total charger volume in 2050 expected to be 87% L2, 9% L1 and 4% DCFC
  - LDV charger volume in 2050 expected to be 90% L2, 9% L1 and 1% DCFC
  - MHDV charger volume in 2050 expected to be 98% DCFC and 2% L2
- Total EVSE volume is driven by residential charging
  - Total charger volume is driven by LDV charging with Single Unit Dwelling (SUD) leading at 86% in 2050 relative to all other use cases
  - LDV charging is primarily driven by L2 technology at 90% with SUD accounting for 88% of chargers in 2050 relative to other LDV use cases
  - MHDV charging is primarily driven by DCFC technology at 98% with MHDV fleet depots accounting for 98% of chargers in 2050 relative to other MHDV use cases

Market Drivers

- Residential charging is largely expected to occur at home
  - L1 charging expected to remain in use, though the share of L1 vs. L2 will remain relatively high through 2050 for scenario A
  - Customers will continue to use L1 as an option for residential use cases due to the existence of older homes and the additional expense and coordination of installing an L2.
- Fleet charging behavior is assumed to largely follow a hub-and-spoke model
  - Most charging is expected to occur within private fleet depots (represented by Fleet-LD, Fleet-MD, Fleet-HD, Bus Transit, and Bus School use cases)
  - Most fleet operators will likely optimize their depot charging behavior to meet their routinized driving needs and fleet size, thus not requiring the use of public charging infrastructure
  - Long-distance freight operations are expected to use public charging spots along highways – this use case is captured as 'Hub' in the EVSE forecast
  - The heavier duty vehicles are expected to rely on DC chargers due to their larger energy demand

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

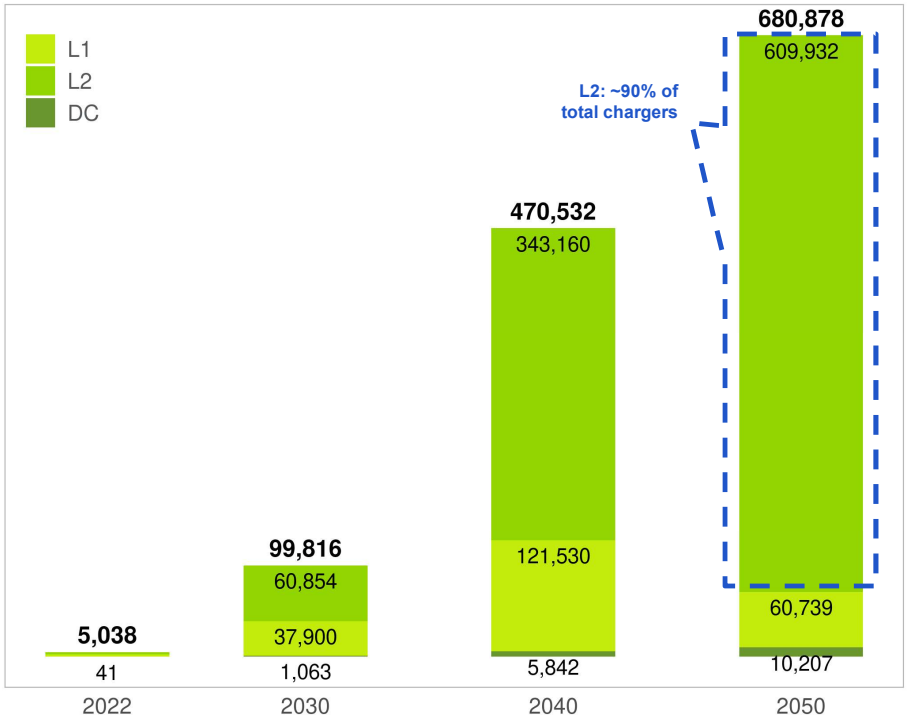
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 20 of 54

~680,000 LDV chargers in 2050, with ~88% SUD penetration

L2 charging has highest penetration, L1 charging still in the mix in latter years, DC penetration low as residential charging drives total charger counts.

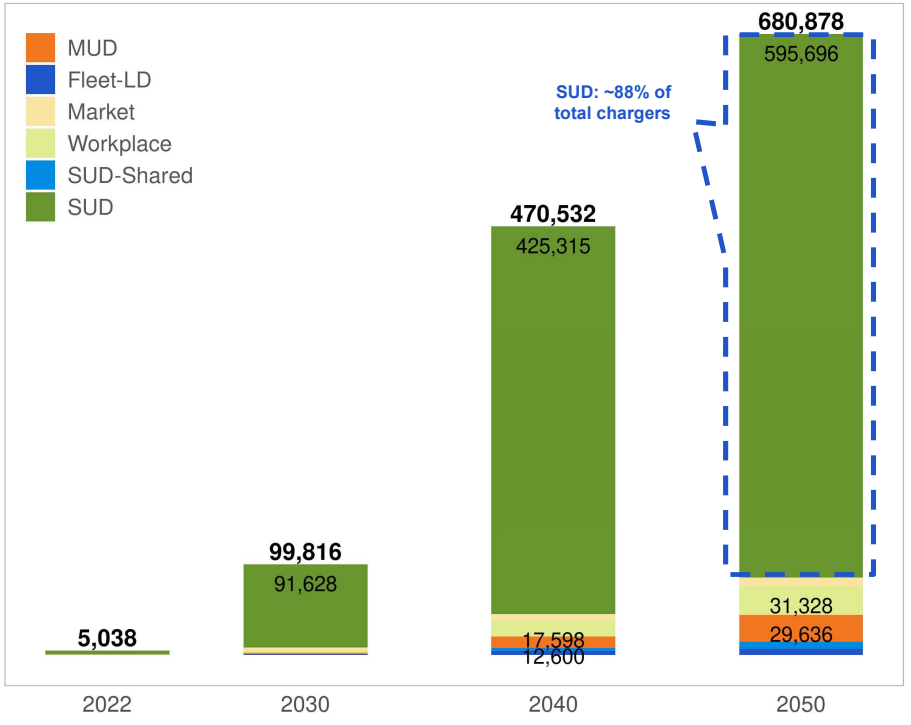
LDV EVSE By Technology

Charger Count, DESC 2022-2050



LDV EVSE by Use Case

Charger Count, DESC 2022-2050

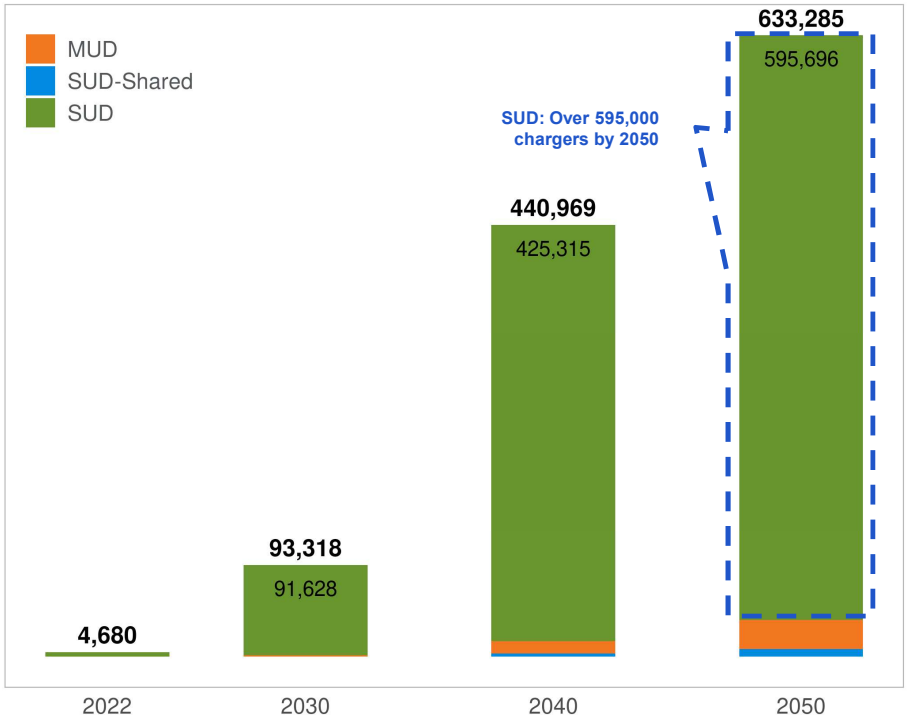


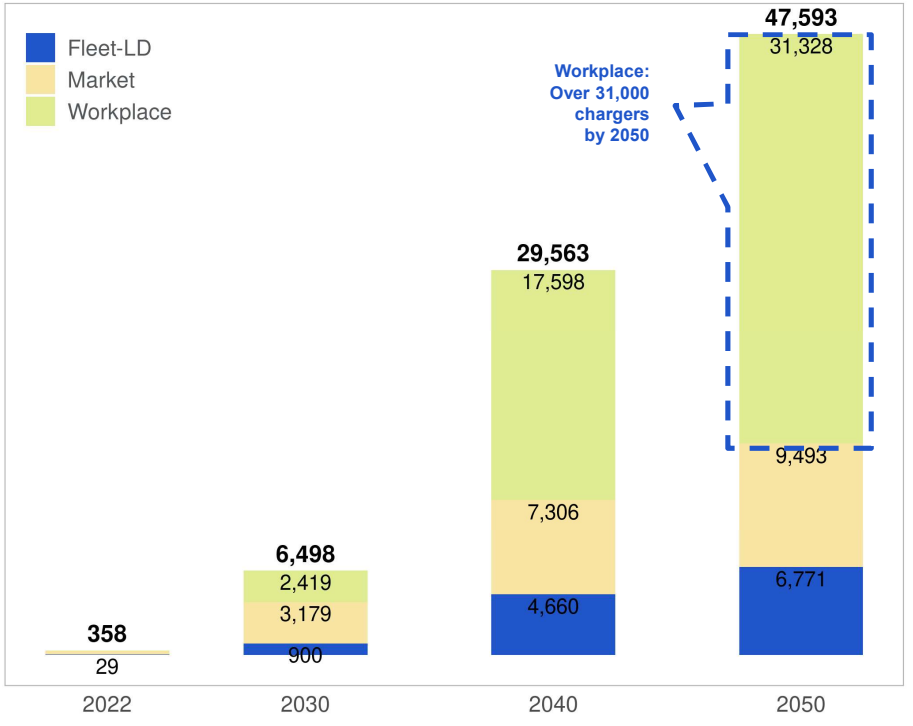
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 21 of 54

Workplace charging estimated to reach ~31,000 in 2050

Residential LDV charging is driven by SUD charging. MUD and SUD-Shared charging continue to grow.
Non-residential LDV charging is driven by Workplace charging, Fleet-LD and Market charging continue to grow.





©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

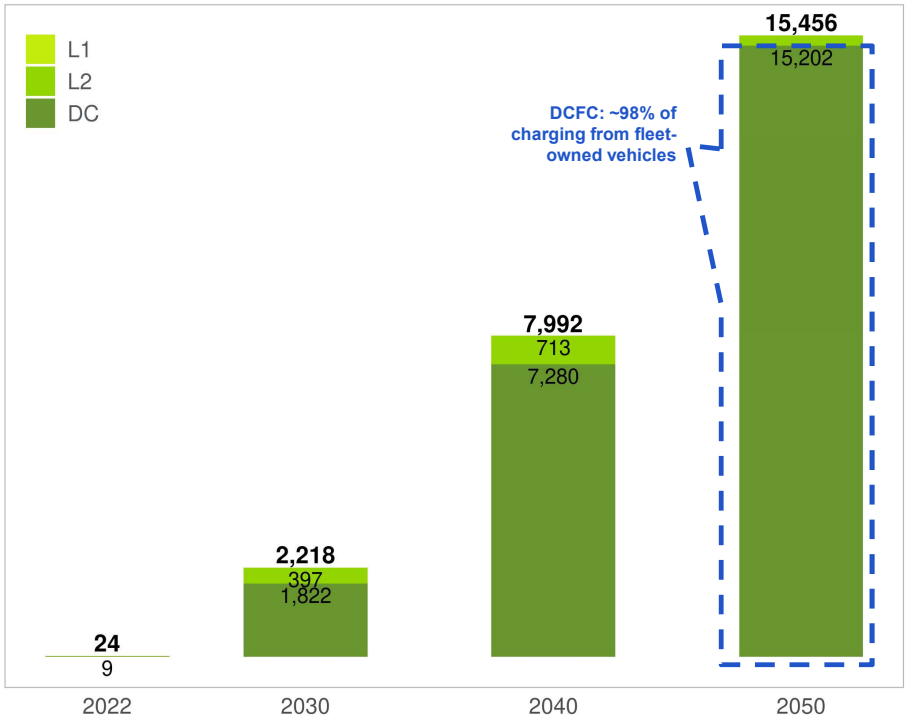
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 22 of 54

~15,000 MHD chargers in 2050, with ~98% DCFC penetration

Most fleet-owned vehicles expected to charger at fleet depot, MHD vehicles expected to use mostly DC charging technology.

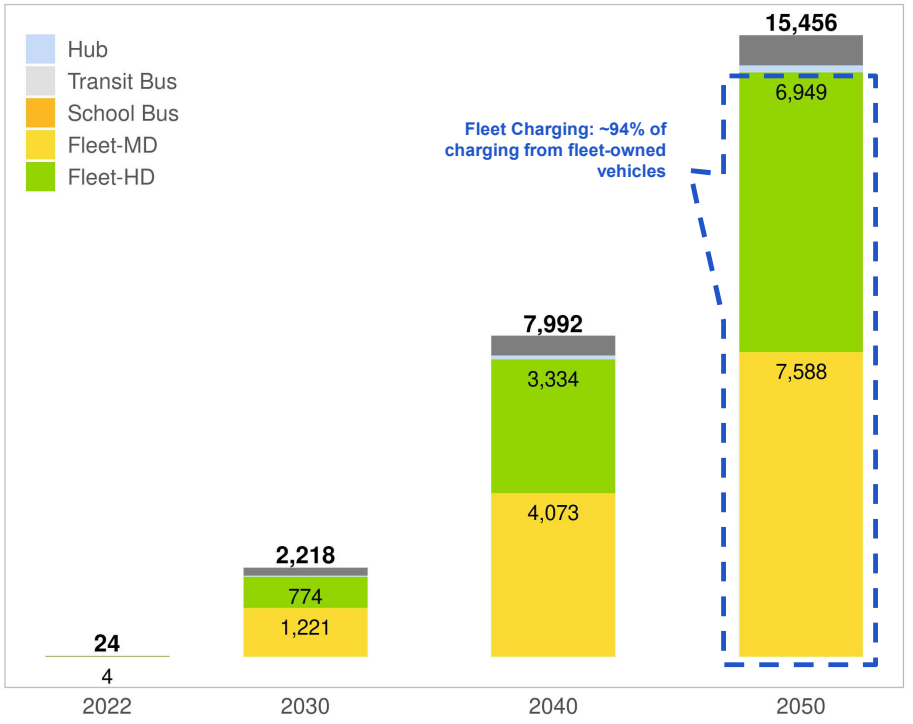
MHDV EVSE By Technology

Charger Count, DESC 2022-2050



MHDV EVSE By Use Case

Charger Count, DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 23 of 54

Guidehouse
Outwit Complexity

DESC Forecast Results: Electric Vehicle & Charging Infrastructure Analysis

DESC Load Impacts Analysis

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 24 of 54

DESC Load Impacts Analysis Summary

Forecast Summary

- LDV & MHDV Charger needs expected to be driven by L2 and DCFC technologies
  - Total charger volume in 2050 expected to be 87% L2, 9% L1 and 4% DCFC
  - LDV charger volume in 2050 expected to be 90% L2, 9% L1 and 1% DCFC
  - MHDV charger volume in 2050 expected to be 98% DCFC and 2% L2
- Total EVSE volume is driven by residential charging
  - Total charger volume is driven by LDV charging with Single Unit Dwelling (SUD) leading at 86% in 2050 relative to all other use cases
  - LDV charging is primarily driven by L2 technology at 90% with SUD accounting for 88% chargers in 2050 relative to other LDV use cases
  - MHDV charging is primarily driven by DCFC technology at 98% with MHDV fleet depots accounting for 98% of chargers in 2050 relative to other MHDV use cases

Market Drivers

- Overall, EV load consumption growth directly correlates with the EV adoption forecast results
  - Annual energy consumption from LDV charging is driven by SUD chargers
  - Annual energy consumption from MHDV charging is driven by Fleet-LD, Fleet-MD, Fleet-HD chargers
- Growth in total rated capacity of chargers in DESC service territory is driven by both the increase in charger count as well as the expected increase in average rated kW per charger
  - Most fleet charging occurs at DCFC chargers as their higher charging needs are better met by chargers rated at a higher kW capacity
  - Higher charging needs are driven by both their higher expected VMT per vehicle than the light-duty passenger class segment, as well as their relatively lower energy efficiency (miles/kWh)

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

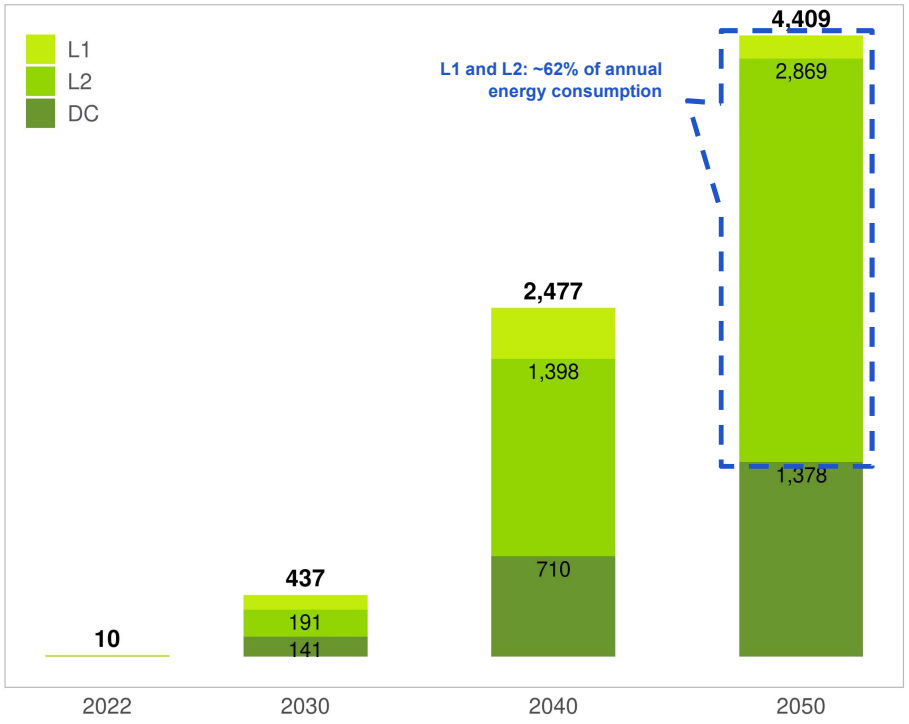
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 25 of 54

Energy consumption expected to reach 4k+ GWH for EV charging in 2050

Most charging is expected to occur at “home-location” charging for residential vehicles and Fleet-LD, Fleet-MD and Fleet-HD for non-residential charging.

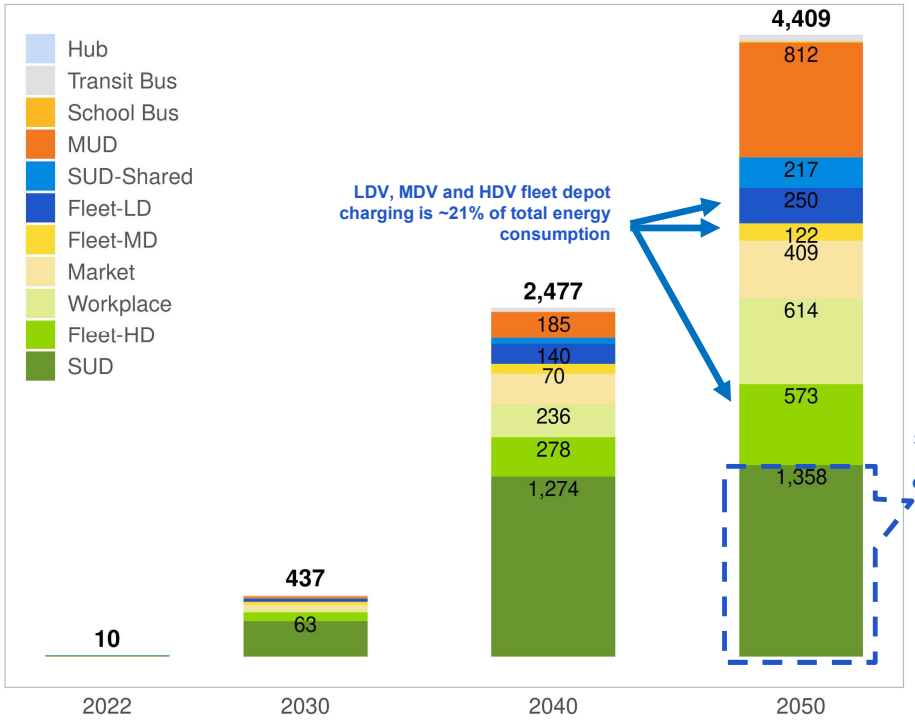
Annual Energy Consumption By Technology - ALL

Impacts (GWh), DESC 2022-2050



Annual Energy Consumption By Use Case - ALL

Impacts (GWh), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

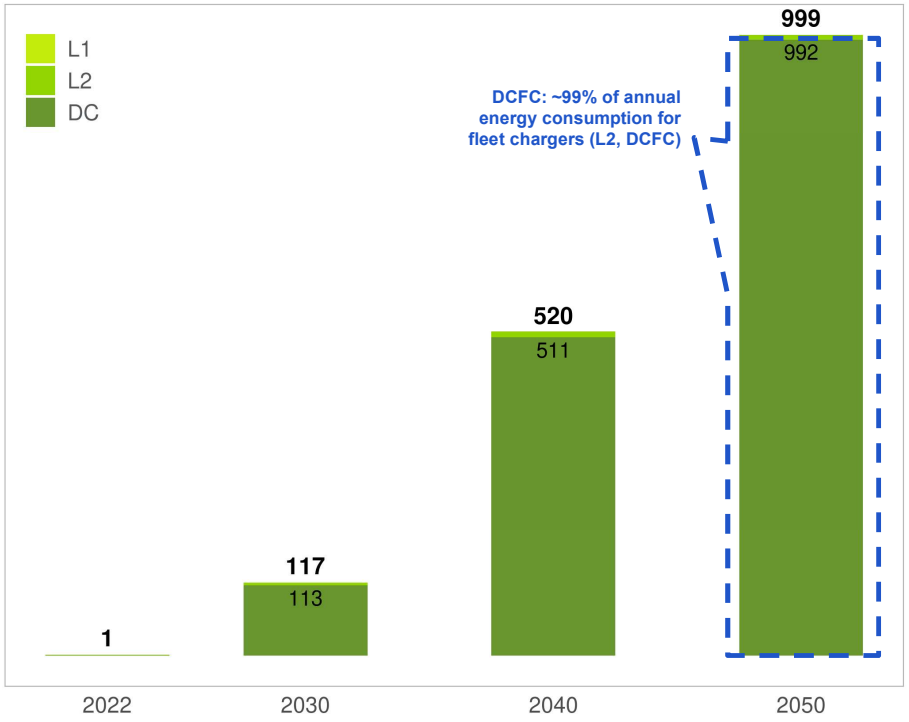
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 26 of 54

Fleet charging energy consumption expected to reach ~1k GWH in 2050

DCFC technology drives energy consumption due to the larger daily charging demand associated with medium and heavy-duty vehicles and the corresponding need for faster charging rates

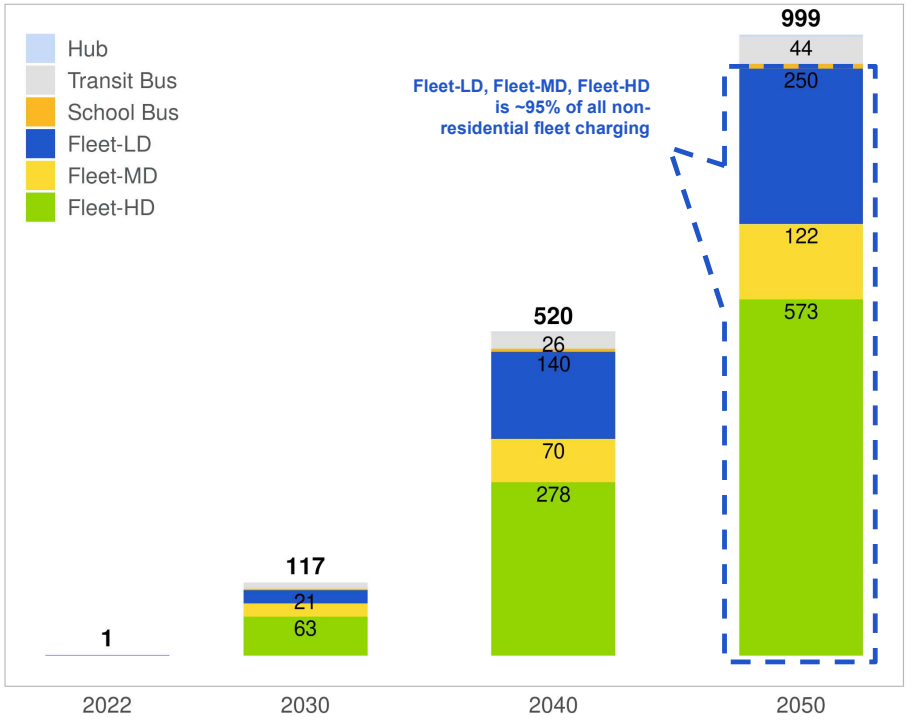
Annual Energy Consumption By Technology - FLEET

Impacts (GWh), DESC 2022-2050



Annual Energy Consumption By Use Case - FLEET

Impacts (GWh), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

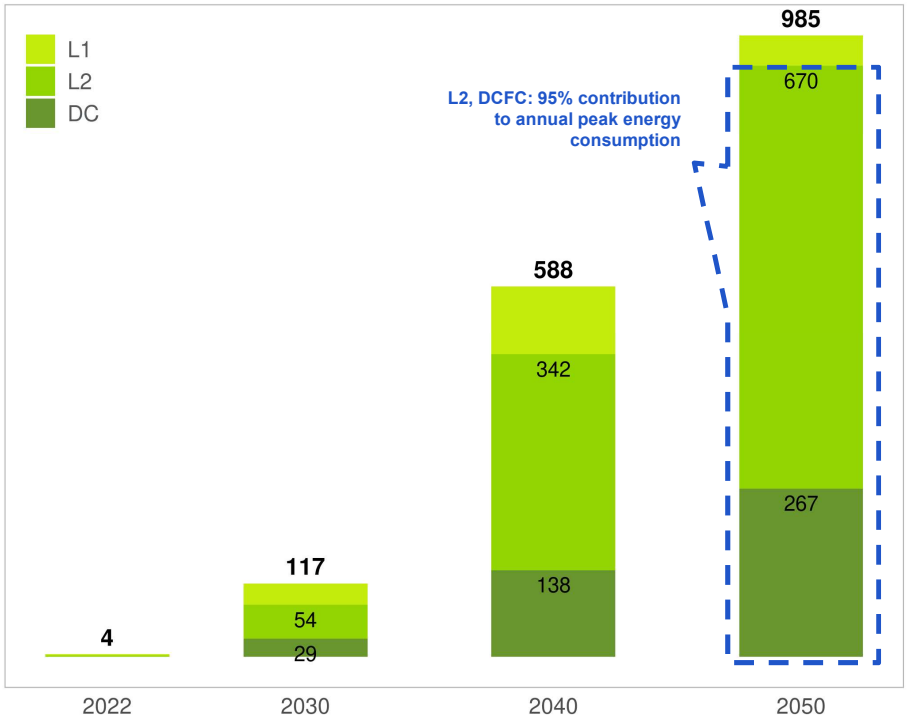
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 27 of 54

Peak energy consumption expected to reach ~1k MW in 2050

Residential charging (SUD, SUD-Shared, MUD) has the highest contribution to annual peak energy consumption at ~54% in 2050.

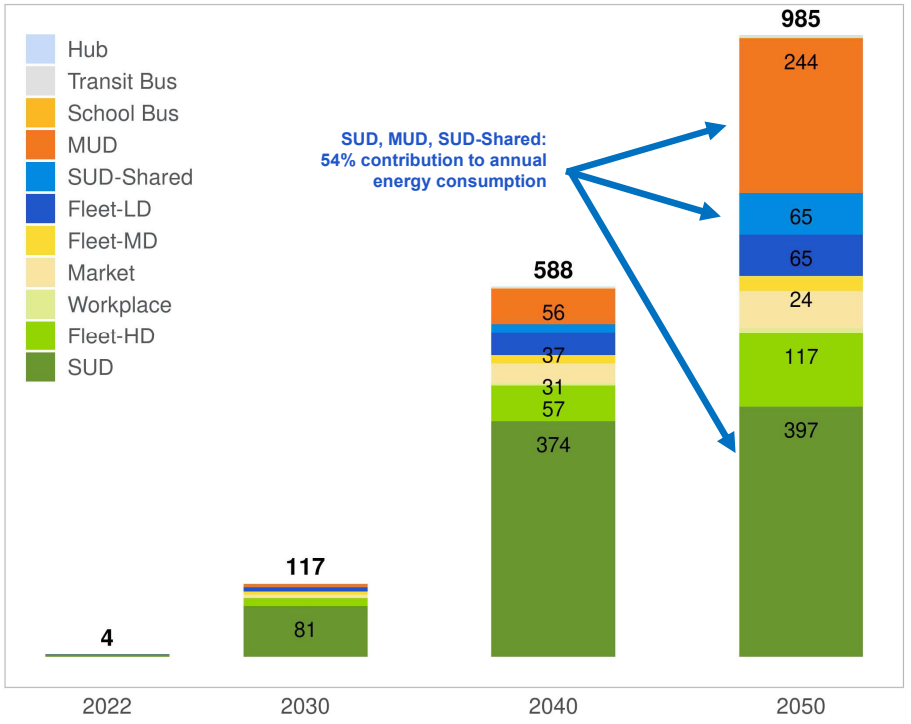
Contribution to Annual Peak Load By Technology - ALL

Impacts (MW), DESC 2022-2050



Contribution to Annual Peak Load By Use Case - ALL

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

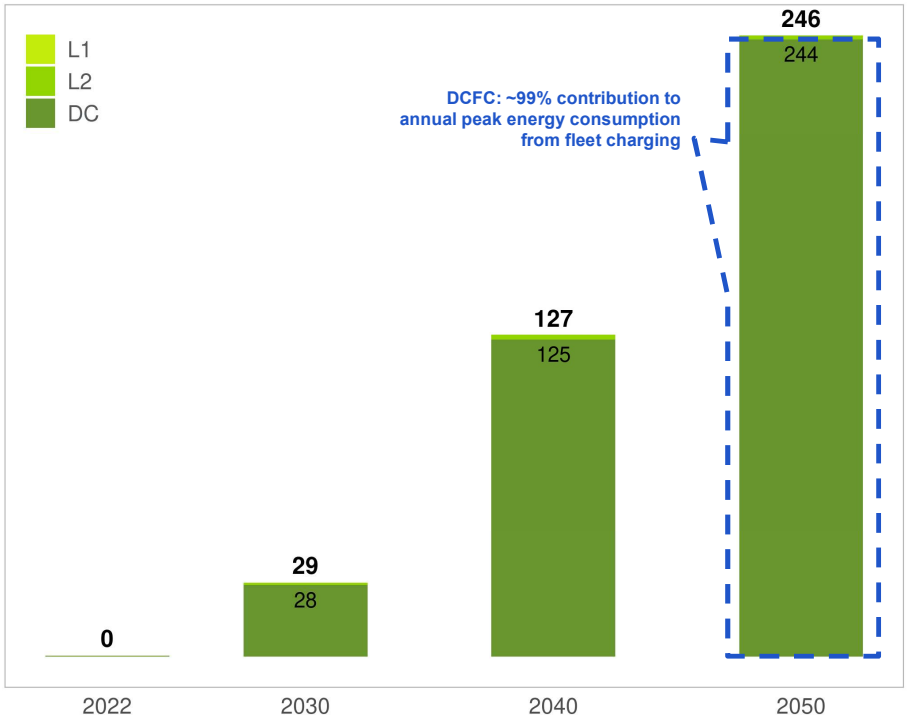
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 28 of 54

Peak energy consumption from fleet charging to reach ~200 MW in 2050

Fleet depot charging (Fleet-LD, Fleet-MD, Fleet-HD) has the highest contribution to annual peak energy consumption (~97%) from all fleet vehicle charging in 2050.

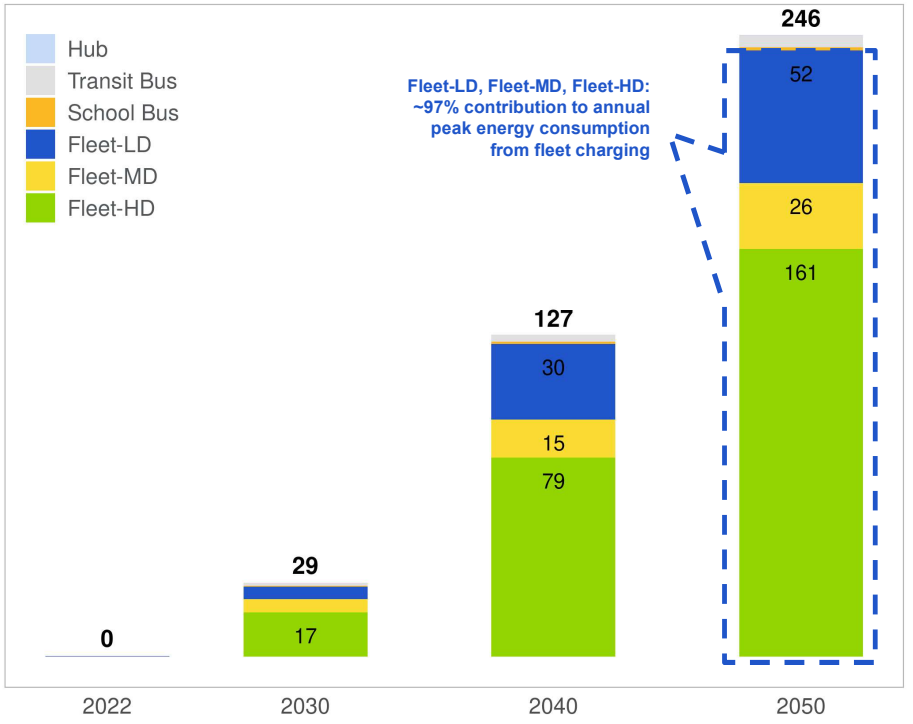
Contribution to Annual Peak Load By Technology - FLEET

Impacts (MW), DESC 2022-2050



Contribution to Annual Peak Load By Use Case - FLEET

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

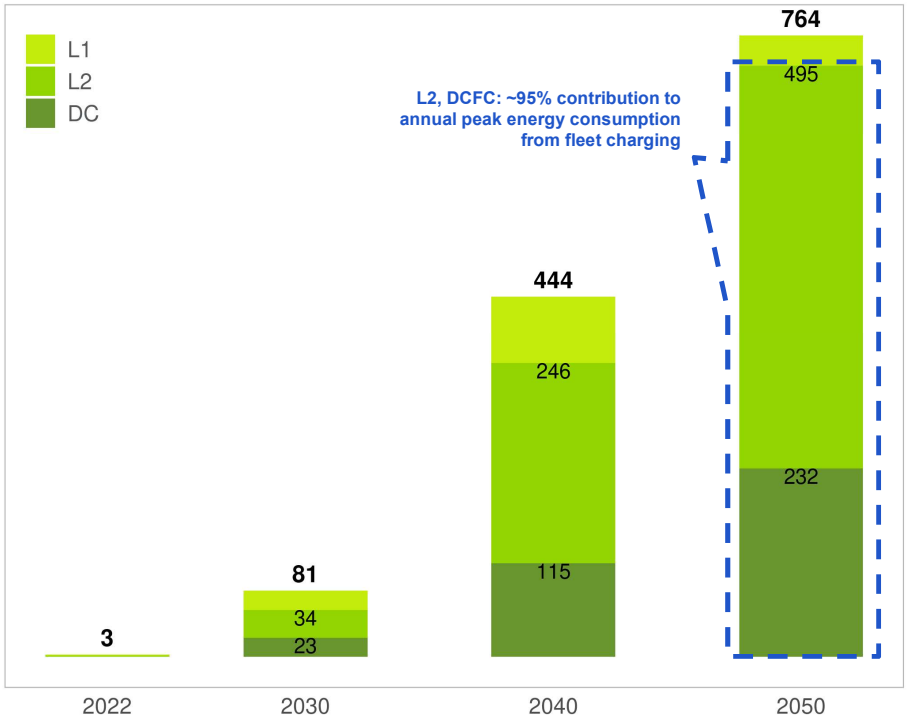
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 29 of 54

Coincident peak expected to reach ~700 MW in 2050

Residential charging (SUD, SUD-Shared, MUD) has the highest contribution to coincident peak energy consumption at ~59% in 2050.

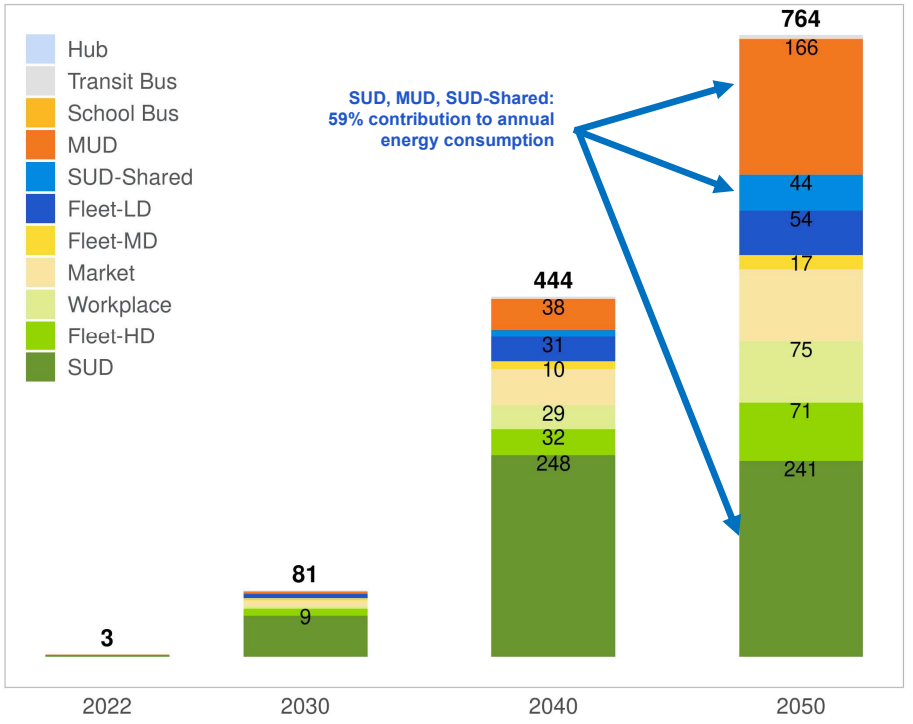
Contribution to Coincident Peak Load By Technology - ALL

Impacts (MW), DESC 2022-2050



Contribution to Coincident Peak Load By Use Case - ALL

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

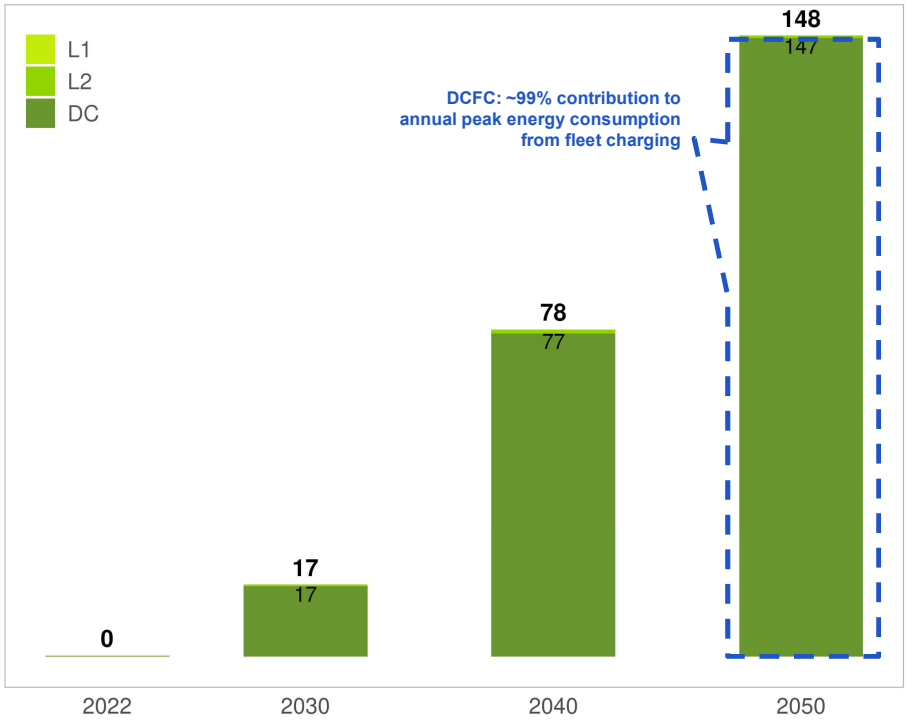
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 30 of 54

Coincident peak from fleet charging expected to reach ~100 MW in 2050

Fleet depot charging (Fleet-LD, Fleet-MD, Fleet-HD) has the highest contribution to coincident peak energy consumption (~96%) from all fleet vehicle charging in 2050.

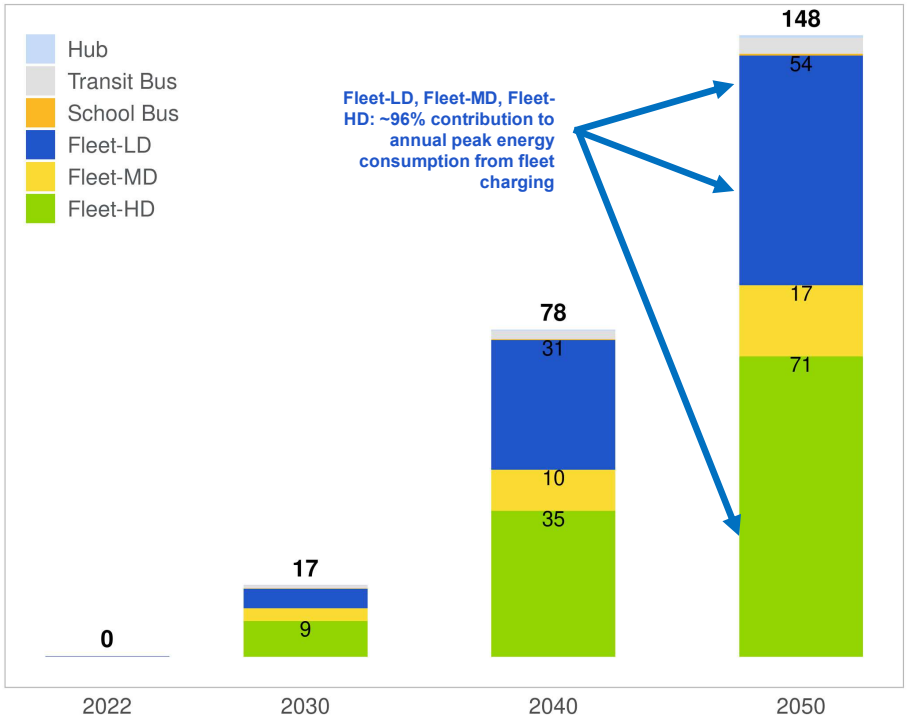
Contribution to Coincident Peak Load By Technology - FLEET

Impacts (MW), DESC 2022-2050



Contribution to Coincident Peak Load By Use Case - FLEET

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

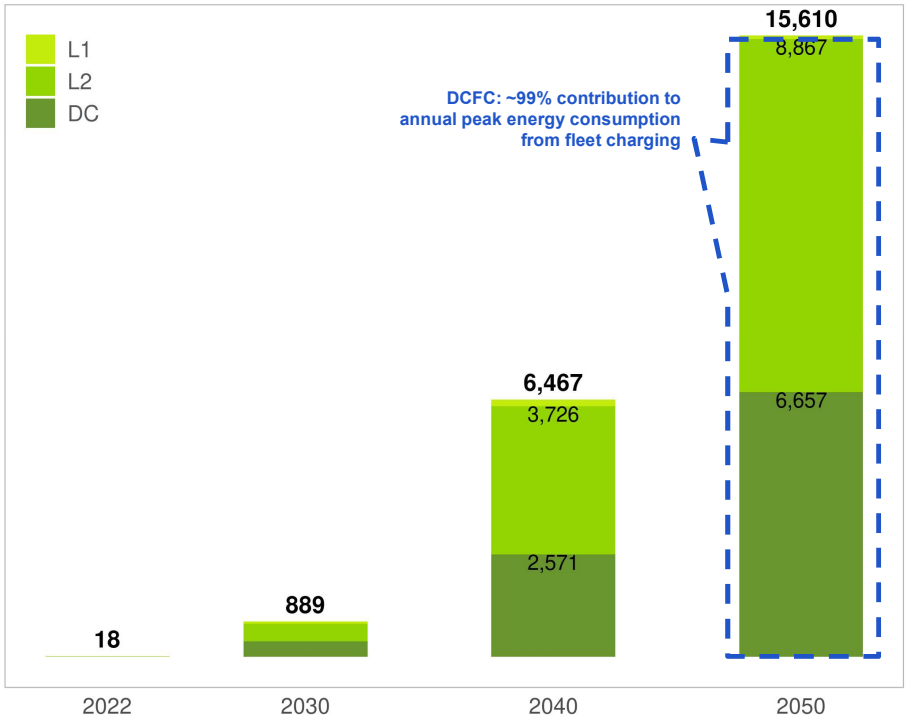
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 31 of 54

Capacity (889 MW) is ~8x > peak load (117 MW) in 2030

Single Unit Dwelling (SUD) charging drives installed MW capacity for all charging in 2050 (~50%).

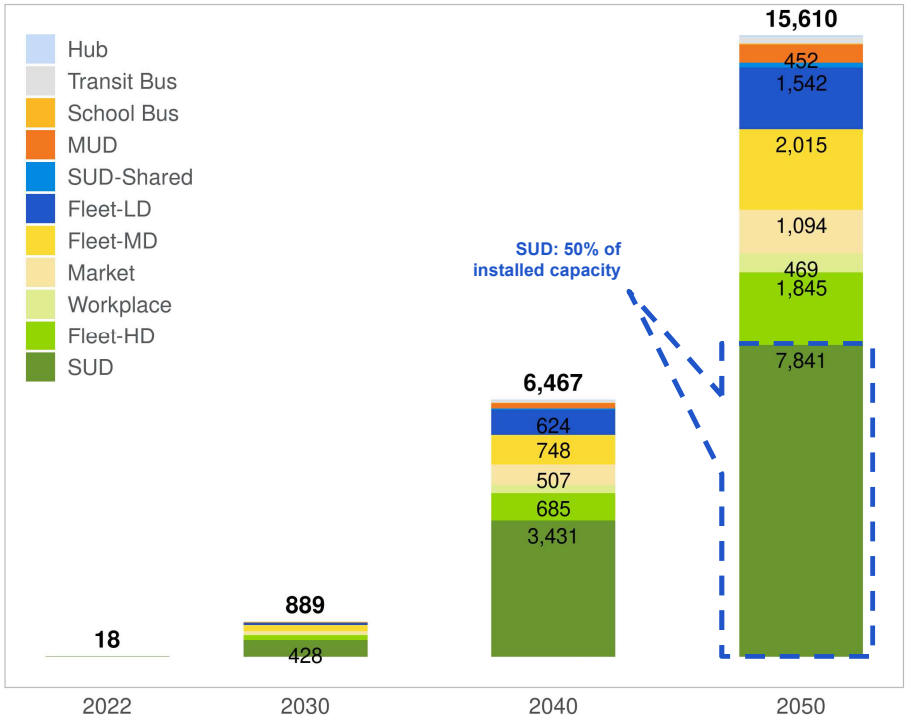
Rated Capacity By Technology - ALL

Impacts (MW), DESC 2022-2050



Rated Capacity By Use Case - ALL

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

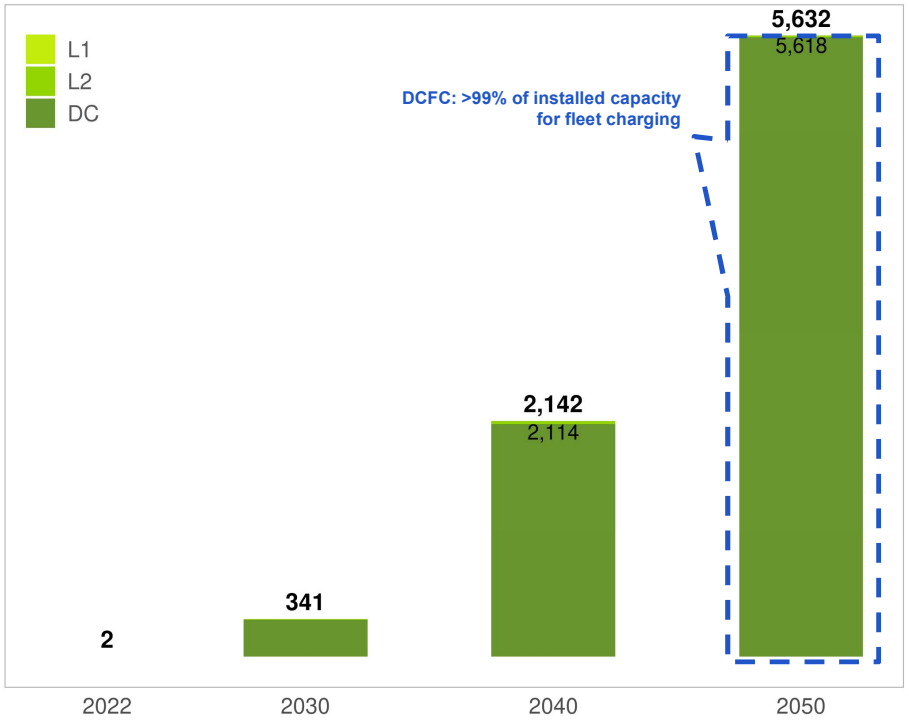
ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 32 of 54

Fleet capacity (341 MW) is 12x > peak load (29 MW) by 2030

Fleet depot chargers (Fleet-LD, Fleet-MD, Fleet-HD) drive installed MW capacity for all fleet charging in 2050 (~96%).

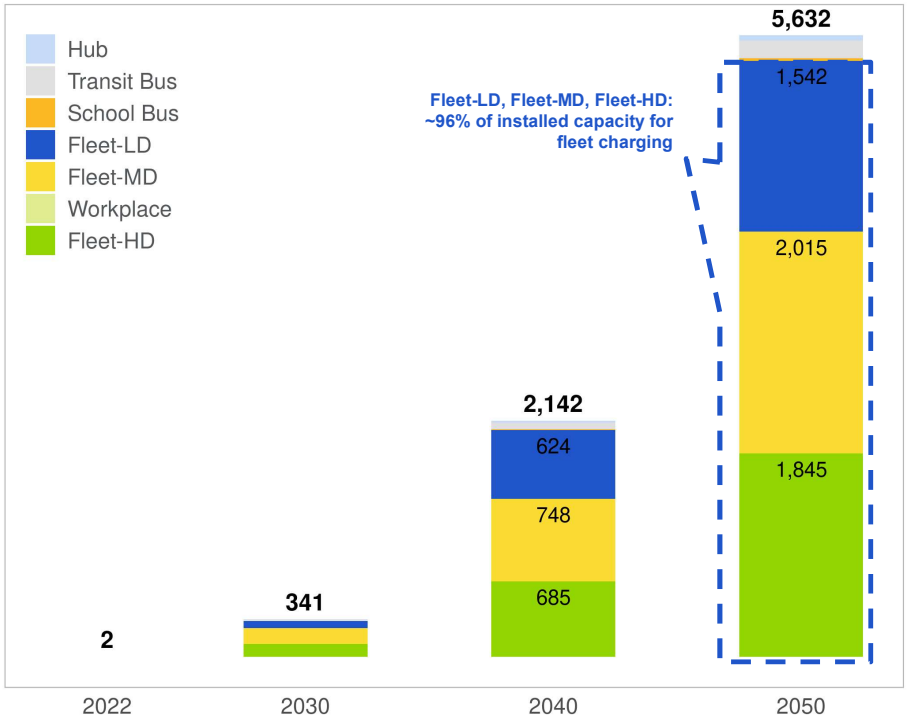
Rated Capacity By Technology - FLEET

Impacts (MW), DESC 2022-2050



Rated Capacity By Use Case - FLEET

Impacts (MW), DESC 2022-2050



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 33 of 54

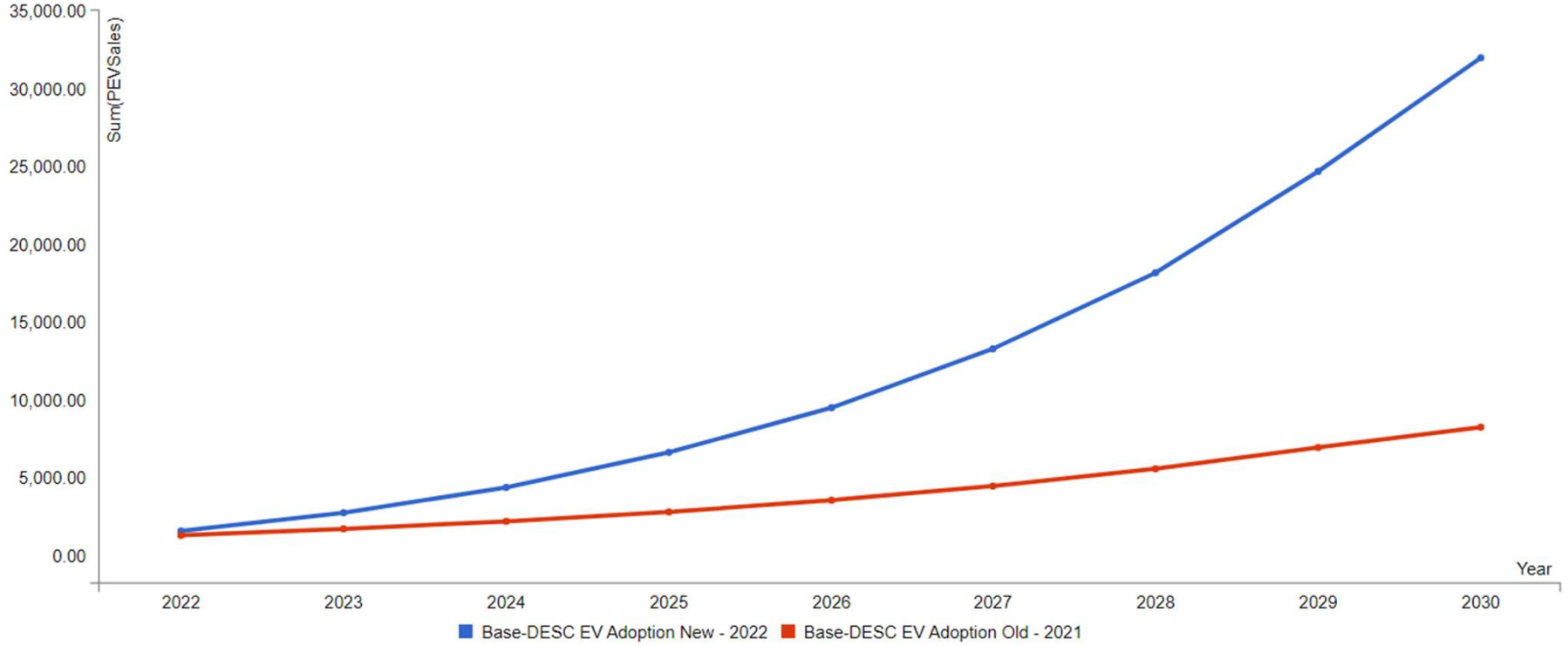
Comparison to Previous Forecast (2021)

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 34 of 54

Forecasted PEV Sales

PEV sales for LDVs and MHDVs expected to reach ~32,000 by 2030. This is a 3x growth relative to 2021 forecast results.

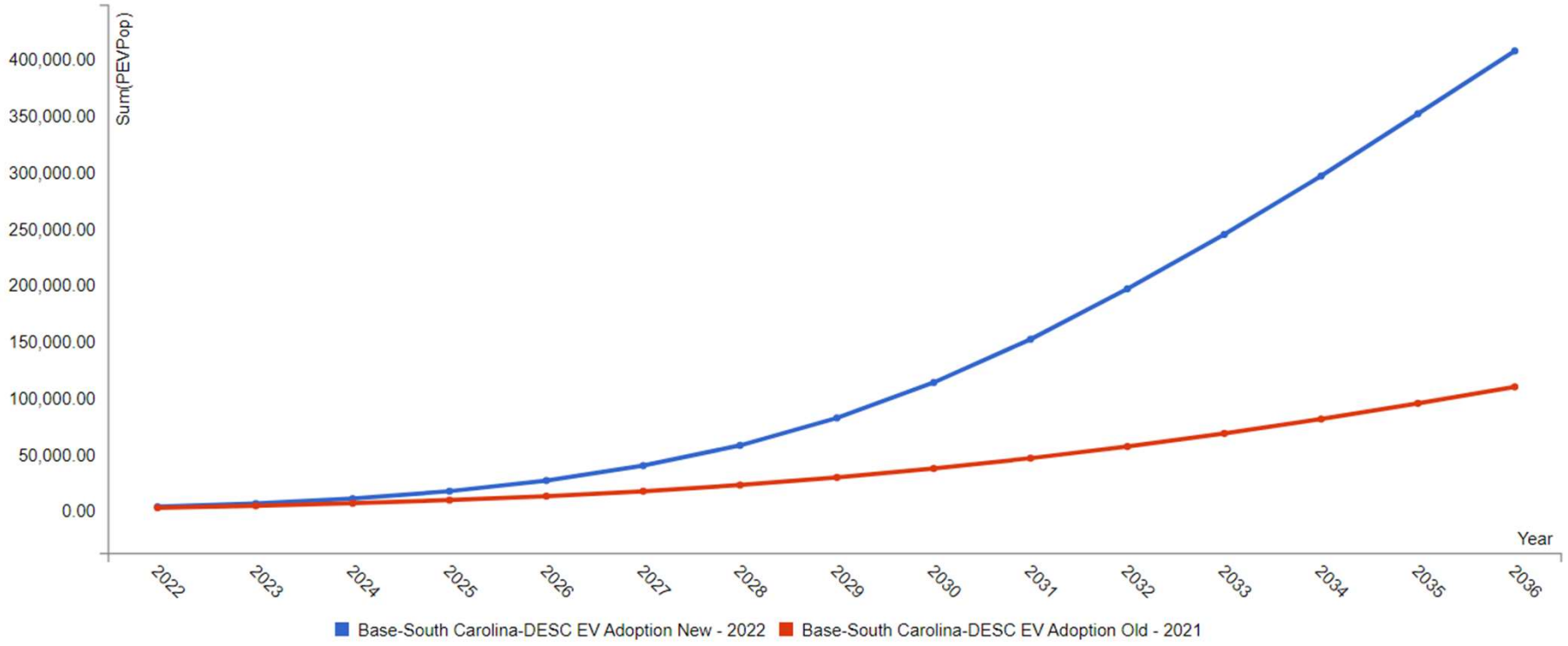


©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 35 of 54

Expected PEV Population

PEVs for LDVs and MHDVs are expected to reach ~115,000 by 2030. This is a 3x growth relative to 2021 forecast results.

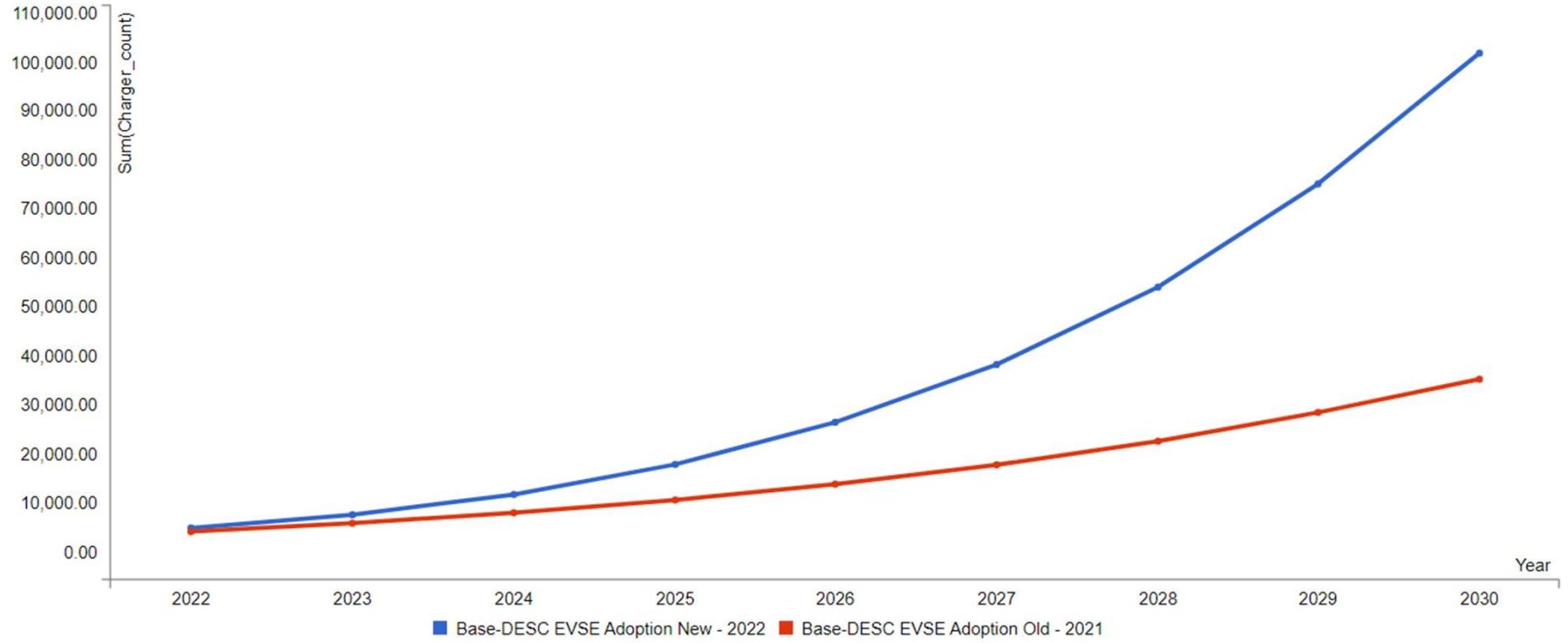


©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 36 of 54

Projected EV Charger Needs

PEV Charger volume for LDVs and MHDVs is projected to reach ~102,000 by 2030. This is a 2x growth relative to 2021 forecast results.



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 37 of 54

Guidehouse
Outwit Complexity

Addendum Files

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 38 of 54

Accompanying Data Files Shared

Summary of the forecast results in the form of .CSV data files are noted below…

Description	File Name
EVSE count by census tracts in DESC territory	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Infrastructure_Tract_2022-10-17
Load profiles	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Load_Profile_2022-10-17
Vehicle sales and population by census tracts in DESC territory	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Potential_In_Territory_2022-10-17
State level vehicle sales and population	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Potential_State_2022-10-17
State level vehicle sales and population by census tracts in all of SC	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Potential_Tract_2022-10-17
Additional: kWh energy and kW capacity by census tracts in DESC territory\	Base_Results_DESC22_IRA_ICEBan_NEVI_DRAFT_2022-10-17_001_Annual_Tract_Level_Energy_and_Capacity_2022-10-17

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 39 of 54

Appendix

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 40 of 54

Guidehouse
Outwit Complexity

Appendix

Forecast Assumptions

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 41 of 54

Zoom-In: Evolving EV Legislative/Policy Landscape

Federal and state actions are providing increased momentum to fuel accelerated EV growth…

Legislative/Policy Action	Description	Impact
1. Changes to ICEV availability	• CA 100% ban of ICEV new car sales by 2035 • Automakers announced to increase production of EVs in response to CA ICEV ban	• All ZEV states will follow CA with similar bans starting 2035 • Non-ZEV states will still have ICEV LDVs available for sale from 2035 onwards, but at lower levels beyond 2035 • Total vehicle sales across all powertrains does not change
a. CA ICEV Ban		
b. Automaker Announcements		
2. IRA: Vehicle and Infrastructure Incentives	• $7.5k credit – 50% battery comp. 50% minerals • Price caps – $55k cars; $80k SUV/Truck/Van • Income cap (AGI) – $150k single; $300k joint • Credit transfers – immediate discount • Business credit: 30% EVSE costs up to $100k • Home credit: 30% EVSE costs up to $1k	• Our forecast suggests the IRA will increase the total PEV fleet by approximately 10%, with greater impact after 2025 • Many vehicles will be ineligible due to price or income caps – more than 2/3 of PEVs in 2025 will cost more than $50k • IRA offers 30% of costs for DC and L2 charging stations. • Due to EVSE purchase inelasticity and historically only ½ of eligible buyers redeem the credit, the IRA results in 7.5% more DC charging stations and 2.5% more for L2 stations.
3. IIJA: NEVI infrastructure impacts	• $5B will be allocated to corridor DC charging – SC NEVI plan approved charging infrastructure	• Includes additions of charging infrastructure based on approved South Carolina NEVI plan
5. IIJA: Community & Corridor Charging and Fueling Grants	• $2.5B for charging on public roads, schools, parks, public parking facilities, and corridors	• Incentives will drive greater adoption of passenger and fleet vehicles
6. IIJA: Low- and No-Emission transit bus Program	• $5.62B to replace, rehabilitate, purchase, or lease buses and bus related equipment	• Incentives for buses will drive greater adoption for buses
4. IIJA: Clean School Bus Program	• $5B over 5 yrs. to replace existing school buses with zero-/low-emission and models	• Includes grant funds for ZEV school buses and incentives for will drive greater adoption for school buses

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 42 of 54

ICEV Availability: Market

Automaker Announcements

- **Nissan** aims to have 40 percent of vehicles sold in the US electrified by 2030.
- **Ford** announced a goal of 50 percent of sales by 2030 will be all electric.
- **Volvo** has committed to becoming a fully electric car company by 2030—with an interim goal of reaching 50 percent of global EV car sales and having one million EVs on the road by 2025.
- **Honda** is aiming for two-thirds of its sales to be electrified globally by 2025.
- **BMW** expects at least half of its car sales in 2030 to be zero emission vehicles.
- **VW** aims for a U.S. market share of over 50 percent for full-electric vehicles by 2030.
- **GM** aims to have more than one million units of EV capacity in North America in response to a goal of BEVs comprising 40 percent of U.S. models.

CA ICEV Ban

- **CA ban: no light-duty ICEV sales in CA from 2035 onwards**
- **New York and Washington have followed suit and passed ICEV bans as well**

Guidehouse assumptions

- **All ZEV states will follow CA and implement similar bans starting 2035**
- **Non-ZEV states will still have ICEV LDVs available for sale from 2035 onwards, but at much less levels of ICEV model availability**
- **Total vehicle sales across all powertrains does not change**

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 43 of 54

IRA: EV assumptions

Vehicle Incentives Policy

- The previous plug-in (PEV) vehicle credit program included a cap of 200,000 PEV sales per manufacturer followed by a phase-out period.
  - Clean Vehicle Credits in the IRA do not have a volume cap.
- Same $7,500 maximum credit as before, now split into two $3,750 halves: North American production of battery components & Critical mineral sourcing.
- New price and income caps:
  - $55,000 for cars; $80,000 for SUVs, Pickups, and Vans.
  - $150,000 AGI cap for single filers, $300,000 for joint filers.
- Credit transfers mean immediate discount as an alternative to tax rebates.

Guidehouse assumptions

- Our forecast suggests the IRA will increase the total PEV fleet by approximately 10%, with greater impact after 2025 as supply chains ramp up
- Many vehicles will be ineligible for credits due to price or income caps – more than two thirds of PEVs planned for 2025 will cost more than $50,000

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 44 of 54

IRA: EVSE assumptions

Charging Infrastructure Policy

- **Business** - a general business tax credit for any company that installs EV chargers, including direct current (DC) fast charging stations. It will offset up to 30 percent of the total costs of purchase and installation of charging equipment, up to $100,000 per charger.
- **Home** - if you install a home EV charging station, the tax credit under the Inflation Reduction Act is 30% of the cost of hardware and installation, up to $1,000.

Guidehouse assumptions

- IRA policies offer approximately 30% and 10% of the overall cost for DC and L2 charging stations.
- Due to EVSE purchases being inelastic (a 10% cheaper charging station does not equal 10% more stations), and since historically only ½ of eligible buyers may redeem the credit, Guidehouse assumes that the IRA results in 7.5% more DC charging stations and 2.5% more for L2 stations.

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 45 of 54

IIJA: EV Relevant Programs

Program	Summary	Agency	Funding
National Electric Vehicle Infrastructure Formula Program (NEVI)	Assume funds will be allocated to corridor DC charging	Department of Transportation (DOT)	$5.0B
Charging and Fueling Infrastructure Grants: Community Charging	Funds available for locations on public roads, schools, parks, and in publicly accessible parking facilities	Department of Transportation (DOT)	$1.25B
Charging and Fueling Infrastructure Grants: Corridor Charging	Deploy electric vehicle charging infrastructure along designated alternative fuel corridors and in communities.	Department of Transportation (DOT)	$1.25B
Low or No Emission (Bus) Grants	Provides capital funding to replace, rehabilitate, purchase, or lease buses and bus related equipment	Department of Transportation (DOT)	$5.62B
Clean School Bus Program	Provides $5 billion over the next five years (FY 2022-2026) to replace existing school buses with zero-emission and low-emission models.	Environmental Protection Agency (EPA)	$5.0B

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 46 of 54

EV Charging Infrastructure Adoption

L1 / L2 Outlook Considered for At-home Residential Charging

Residential L1/L2 Outlook A:

L1 continues to be significant infrastructure option for at-home residential customer use.

Market Drivers & Assumptions:

- L1 is free (no incremental charger cost) – does not require panel upgrades
- L1 is adequate to meet the needs of most light duty residential vehicle duty cycles (average VMT ~10k), and keep the battery at 80+ percent
  - Not true for LTs with efficiency less than 2.5 miles/kwh or so
  - Not true for high-mileage travelers without workplace/destination charging
  - Not true for 2 BEV households
- We expect L1 charging to remain in use, though the share of L1 vs. L2 will remain relatively high through 2050 for scenario A
- Customers will continue to use L1 as an option for residential use cases due to the existence of older homes and the additional expense and coordination of installing an L2.

Forecast Thesis (here's what you'd need to believe):
Customers adopt chargers based on base charging need (meetings most charging need and lower financial impact) and depend on distributed charging for Fast Charge requirements.

Residential L1/L2 Outlook B:

L2 market share increases significantly as predominant infrastructure option for residential customer use.

Market Drivers & Assumptions:

- Level 2 chargers are expected to be more prevalent over time than Level 1 chargers in Single-Unit Dwellings (SUD) moving forward, as they become more affordable and already provide quicker charging times.
- We expect this to hold in the future years as L2 gets cheaper.
- We expect L1 charging to continue as an option for residential use cases due to the existence of older homes.
- Though L1 will remain in use, the share of L2 vs. L1 will grow more rapidly in scenario B as L2 prices decrease, vehicle battery capacity continues to increase (300+ mi), and customers preference the convenience of quicker charging

Forecast Thesis (here's what you'd need to believe):
Customers adopt L2 to provide charging optionality at home (despite higher potential cost)

Guidehouse

©2022 Guidehouse Inc. All Rights Reserved

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 47 of 54

Guidehouse
Outwit Complexity

Appendix

Comparison to 2022 Forecast to Pre-Incentive forecast scenario

©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. For internal use only.

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 48 of 54

Forecast Comparison: 2022 Forecast vs. 2022 (Pre-Incentive)

Forecast Updates To Account for Federal & State Policy

Update	When	Notes
Vehicle Registration Data	Sep ’22	Update from IHS Markit
Fuel Prices projections	Sep ’22	Blended short- and long-term outlooks from EIA
Fuel Efficiency projections	Sep ’22	Based on updated research from Guidehouse’s Insights Team
Vehicle Miles Traveled Data	Sep ’22	Based on research from national laboratories
Existing Charging Station Data	Sep ’22	Updated from AFDC
Changes to ICEV availability	Oct ‘22	Impacts from CA’s recent ICEV ban and automaker announcements
IRA: Vehicle incentives	Oct ‘22	
IRA: Infrastructure incentives	Oct ‘22	Workplace and home charging
IIJA: NEVI infrastructure impacts	Oct ‘22	Includes additions of charging infrastructure based on approved South Carolina NEVI plan
IIJA: Clean School Bus Program	Oct ‘22	Includes grant funds for ZEV school buses
IIJA: Charging and Fueling Infrastructure Grants	Oct ‘22	Includes incentives for corridor and community charging infrastructure
IIJA: Low- and No-Emission transit bus Program	Oct ‘22	

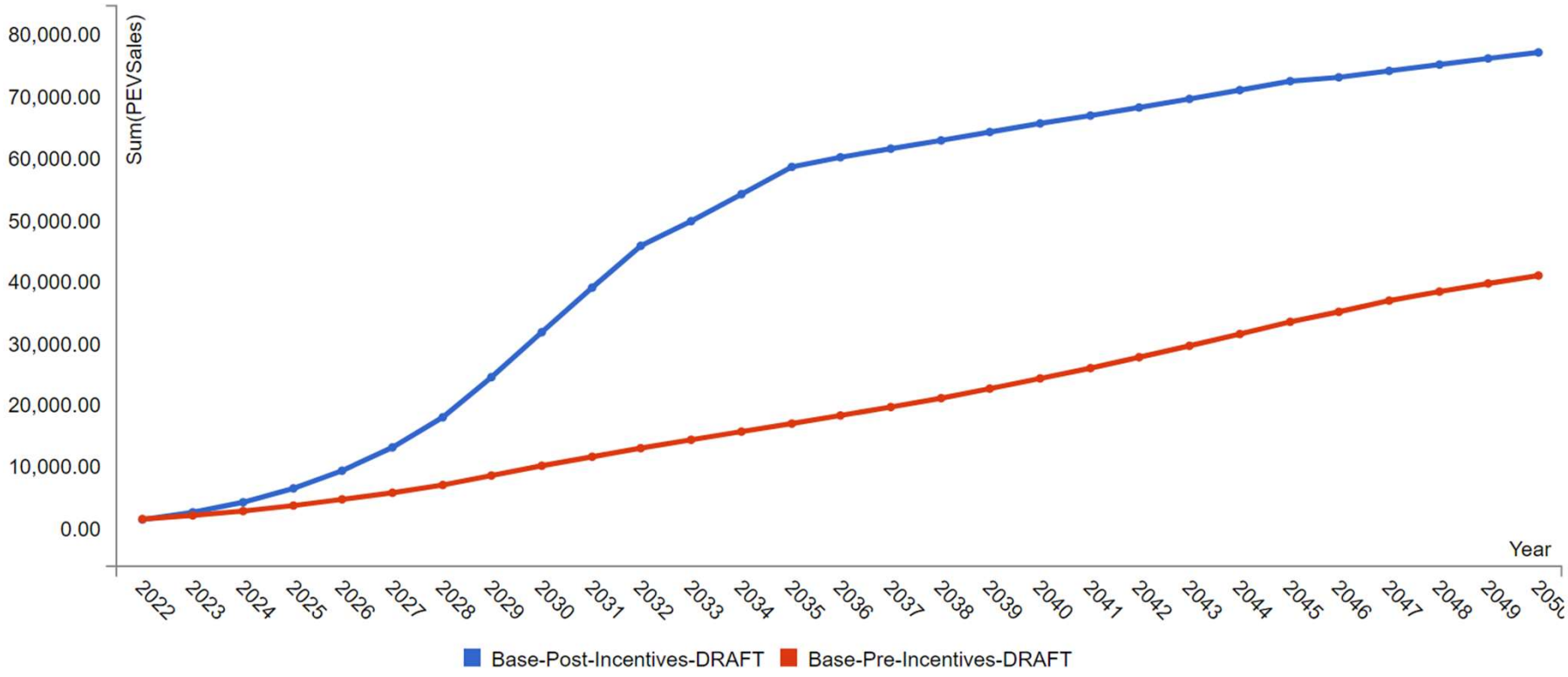
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 49 of 54

Forecast Comparison: 2022 Forecast vs. 2022 (Pre-Incentive)

Forecasted PEV Sales

PEV sales for LDVs and MHDVs expected to reach ~32,000 by 2030. This is a 3x growth relative to pre-incentives draft results.



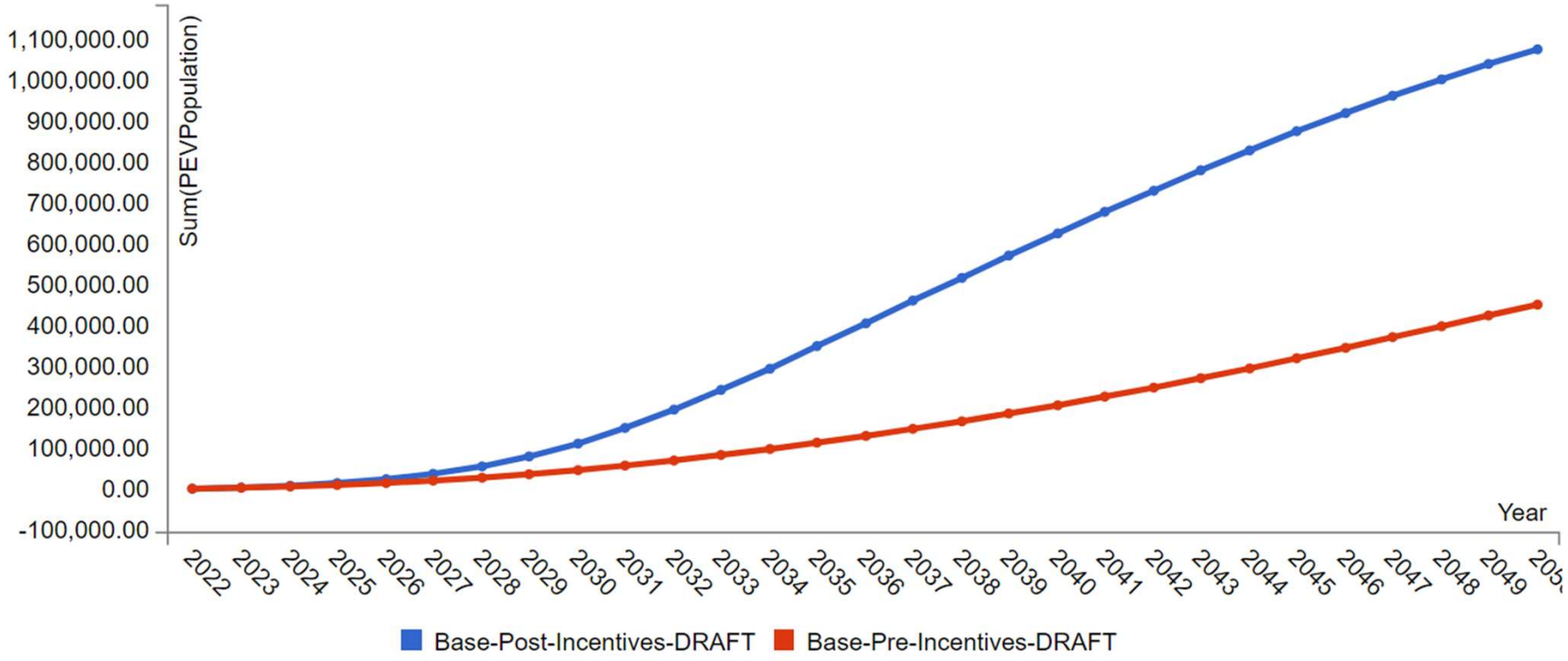
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 50 of 54

Forecast Comparison: 2022 Forecast vs. 2022 (Pre-Incentive)

Expected PEV Population

PEVs for LDVs and MHDVs are expected to reach ~115,000 by 2030. This is a 2x growth relative to pre-incentives draft results.



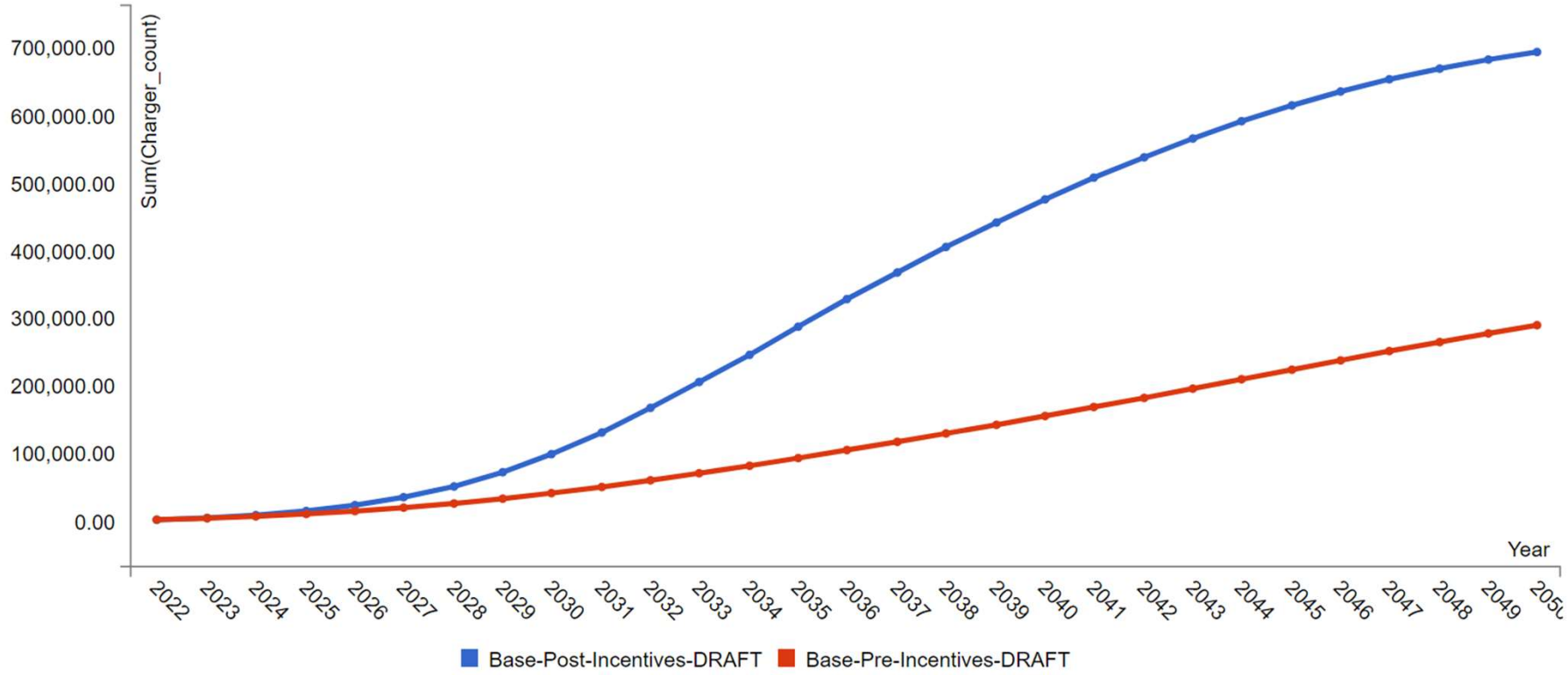
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 51 of 54

Forecast Comparison: 2022 Forecast vs. 2022 (Pre-Incentive)

Projected EV Charger Needs

PEV Charger volume for LDVs and MHDVs is projected to reach ~102,000 by 2030. This is a 2x growth relative to pre-incentives draft results.



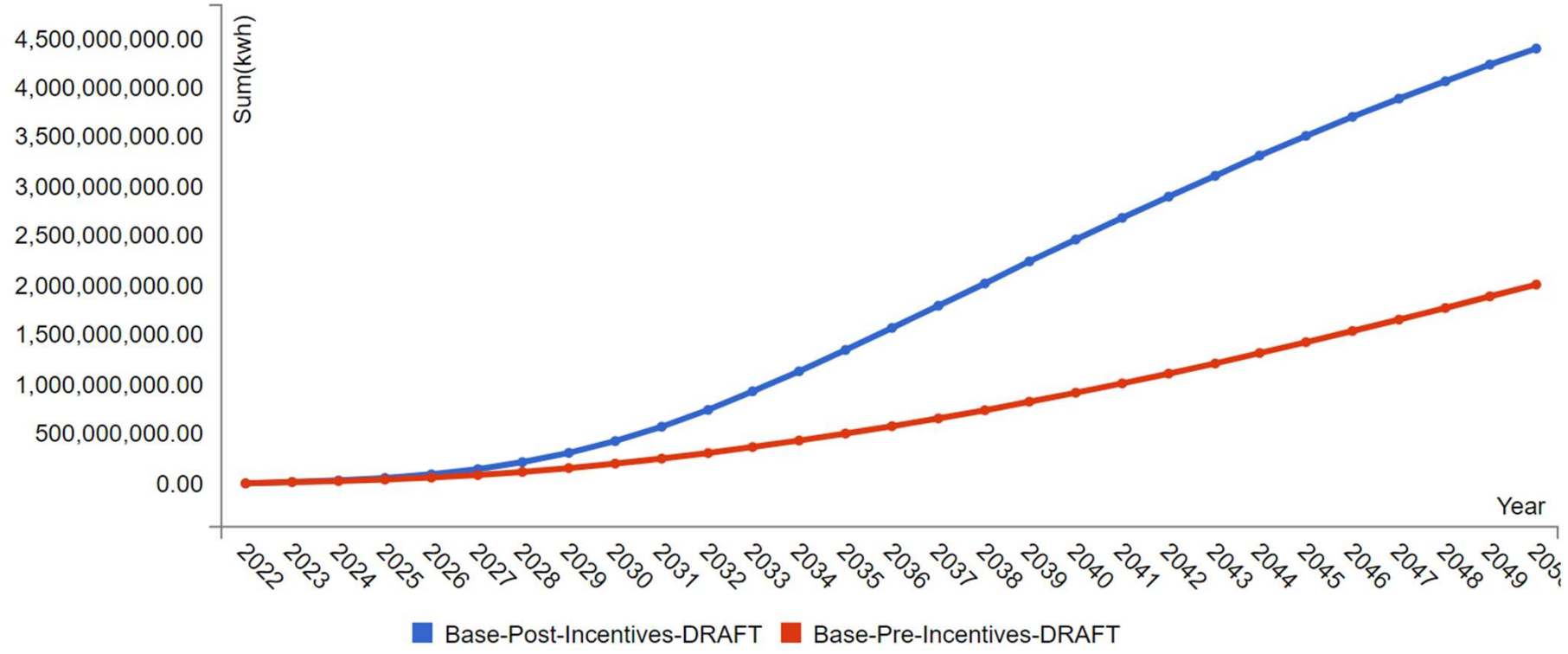
©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 52 of 54

Forecast Comparison: 2022 Forecast vs. 2022 (Pre-Incentive)

Forecasted EV Load

kWh energy to power LDVs and MHDVs is projected to reach ~437GWh by 2030. This is a 2x growth relative to pre-incentives draft results



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensitive. CLIENT PROPRIETARY | PRIVILEGED AND CONFIDENTIAL

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 53 of 54

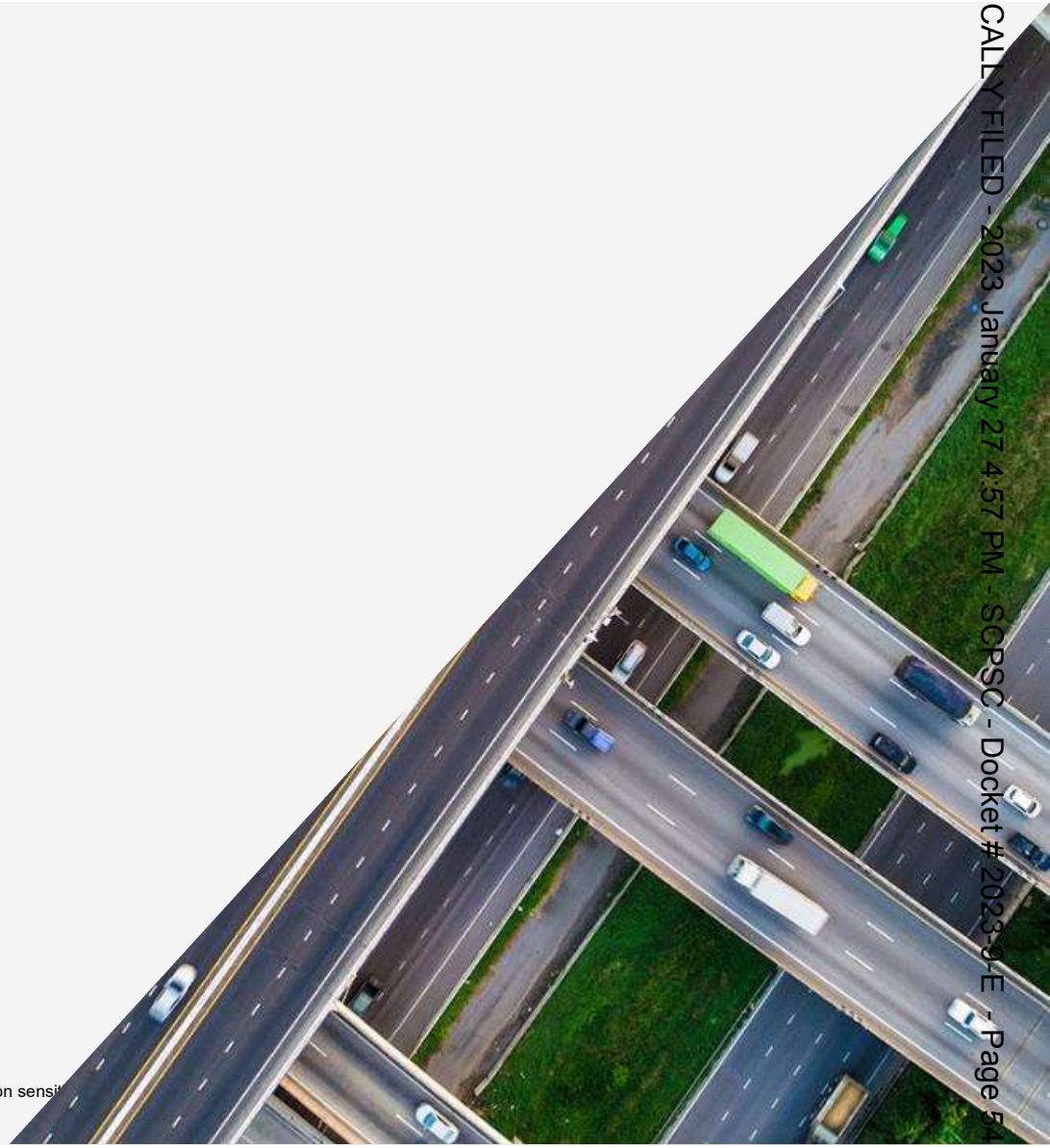
Contact

Chip Wood
Partner
chip.wood@guidehouse.com
704.347.7791

Erik Larson
Director
erik.larson@guidehouse.com
214.712.1522

Vivek Nath
Associate Director
vivek.nath@guidehouse.com
202.973.3205

Shaun Caldwell
Associate Director
shaun.Caldwell@guidehouse.com
678.755.9040



©2022 Guidehouse Inc. All rights reserved. Proprietary and competition sensi

ELECTRONICALLY FILED - 2023 January 27 4:57 PM - SCPSC - Docket # 2023-9-E - Page 54 of 54